# A Comparison of a Web-based versus Face-to-Face Social Support-enhanced Weight Loss Program in Nurses: A Pilot Randomized Clinical Trial

A DISSERTATION
SUBMITTED TO THE FACULTY OF
UNIVERSITY OF MINNESOTA
BY

Julie Ann Sabo MN, RN, APRN, CNS

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY

Diane Treat-Jacobson PhD, RN, Adviser

May 2016

**Acknowledgements**

I would like to thank my academic advisor, Diane Treat-Jacobsen for her support and guidance throughout my doctoral studies. I would also like to thank my other committee members: Cynthia Gross, Ruth Lindquist, Kay Savik, and statistician Michelle Mathiason Moore.

Thank you to all the nurses in my life, who have inspired, mentored and generally put up with me during my maturation as a nurse and hopefully a nurse scientist.

I am grateful for the support I have received from the Minnesota Nurses Foundation for scholarships and grants to support my education and research. Thank you to the Rahr Foundation for their financial support which made it possible for me to continue with my studies.

A special thank you to the individuals who participated in this research. Their time and efforts made the final goal a reality.

## Dedication

This thesis is dedicated to my family.

## Abstract

**Background:** Over one third of the United States population is classified as obese or overweight and obesity rates have remain unchanged over the last decade. Obesity and being overweight is the fifth leading causes of deaths globally. Lifestyle changes involving diet and activity can be difficult to initiate and even more difficult to maintain. Therefore, achieving and maintaining weight loss remains difficult for many overweight and obese people. Preliminary studies have shown success with weight loss programs that use social support methods other than face-to-face, such as individual support via telephone calls or remote personal support via web-based methods, as an adjunct intervention for weight loss.

**Objective:** The aims of this study were to determine the feasibility and efficacy of a web-based (WB) versus face-to-face (F2F) social-support enhanced weight loss intervention.

**Method:** Registered nurses who had a body mass index (BMI) of over 25 $kg/m^2$ were asked to participate. Participants were randomized to either WB or F2F social support- enhanced weight loss intervention. All participants followed the Dietary Approach to Stop Hypertension, and attended 12 weekly sessions with a social support component delivered via web-based or face-to-face. End points for feasibility were attendance, adherence with nutrition diary, and satisfaction level. End points for efficacy were weight, BMI, blood pressure (BP), and waist to hip ratio (WHR), and were measured at weeks one, five, eight, and twelve. Data were analyzed for between group differences using non-parametric tests.

**Results:** A total of nine participants were enrolled in the study. Participants were all females, with a median age of 42.5 years in the F2F group and 36 years for the WB group. There were no differences between groups for the feasibility end points of attendance, adherence, and satisfaction levels. There were no differences between groups in all efficacy endpoints of anthropomorphic and BP measurements (except WHR) for all time points. WHR was

significantly different between groups, with better outcomes in the WB group. The median weight loss in the WB group was 2.4 kg, and the F2F group 3.8 kg. The change in BMI for the WB group was 0.80 $kg/m^2$ and for the F2F group 1.54 $kg/m^2$.

**Conclusions:** The similar feasibility endpoints of attendance, adherence, and satisfaction levels suggest that a WB social support-enhanced weight loss intervention may be acceptable and feasible alternative to a F2F social support-enhanced weight loss intervention. Conclusions regarding efficacy cannot be formed due to the small sample size and lack of power to detect clinically meaningful differences between groups. The lack of differences between groups is encouraging, and two participants in the F2F group achieved clinically meaningful weight loss of 4.7 and 14.6 kg. Overall findings of this study are consistent with previous studies. Continued studies in web-based methods of social support as an adjunct intervention for weight loss are needed.

## Table of Contents

## Table of Contents

## List of Tables

## List of Figures

Page

# Chapter 1: Introduction

## Background of the Problem and Study Aims

Obesity and being overweight is the fifth leading cause of deaths globally, 44% of the burden of diabetes, 23% of ischemic heart disease, and up to 14% of the burden of cancer (World Health Organization, 2013). Obesity is defined as body mass index (BMI: weight in kilograms/meters squared) of greater than 30 and an individual is considered overweight with a BMI over 25. Much of the consequences of obesity and being overweight are preventable and weight loss can be achieved as a preventative measure.

According to the National Heart, Lung, Blood Institute Obesity Initiative (NHLBI, 2011), therapies for weight loss include reducing caloric intake by 500-1000 calories from normal baseline, increasing physical activity, behavior therapy pharmacotherapy, or surgical intervention. Standard therapies are the first three used in combination or alone, and are the first interventions to be used. Yet, weight loss remains elusive for many, and maintenance of weight loss even more difficult to achieve. Additional therapies may be added to assist in weight loss, such as more intensive behavior therapy and mind-body interventions.

Among the diets used to promote weight loss is the Dietary Approaches to Stop Hypertension (DASH). The DASH diet emphasizes eating fruits, vegetables, low fat or nonfat dairy foods, fish, low saturated fat protein, and whole grains. This diet is commonly used for weight reduction, and has been shown to reduce blood pressure (NHLBI, 2006). It is easily followed and has guides for goals of consumption of 1,600-3,100 calories a day.

Increased caloric expenditure through increased physical activity is the second behavioral approach to weight loss. The NHLBI (2011) goal for physical activity is to engage in moderate levels of physical activity, for at least 30-45 minutes, three to five days a week. The NHLBI (2011) defines moderate amounts of physical activity as one that uses approximately 150 calories

of energy per day, or 1,000 calories per week. Promoting physical activity beyond this level is expected to result in increased energy expenditure and corresponding weight loss.

Behavior therapy has been shown to assist with compliance with reduced caloric intake and physical activity, therefore impacting weight loss (NHLBI, 2011). Behavior therapy strategies for weight loss include such components as self-monitoring of diet and physical activity, managing stress, identifying barriers to compliance, strategies to enhance compliance to a calorie restricted diet, and social support (NHLBI, 2011). Through behavior modification, new skills are learned that allow an individual to change behavior using techniques learned in individual, group, or Web-based sessions.

Social support to augment weight loss is recommended by the NHLBI (2011) to improve compliance with diet and physical activity. Despite the benefits of using the three traditional methods of weight loss and the NHLBI recommendation of adding social support, health care providers do not routinely offer counseling or social support methods, and weight loss remains a significant health issue and difficult to achieve for many. Reasons given for health care providers not providing counseling or social support groups include lack of time, staffing issues, reimbursement, and lack of experience in providing counseling through group support groups by providers (Digenio, Mancuso, Gerber & Dvorak, 2009). In addition to those challenges, face-to-face groups for social support and counseling require a space in which to meet, on-site trained leaders, commitment to attend the sessions by the participants, and ability to travel to the meetings. The requirements for travel can be prohibitive to participants, and the requirements for the offering of the programs costly to the providers. Preliminary studies show success with weight loss programs that include social support using other methods than face-to-face such as individual support via telephone calls, and remote personal support via web-based methods

(Aggarwal et al., 2012; Appel et al., 2011; Bennett et al., 2012; Jeffrey et al., 2009; Tate, Jackvony, & Wing, 2006).

The proliferative use of the Internet makes web-based methods a feasible and potentially advantageous option for interactive social support for weight loss. The Pew Research Center's Internet & American Life Project (May, 2013) reports utilization of the Internet at 85% of the adult population, including people from all income levels, diverse ethnic and racial backgrounds, and those who live in suburban and rural areas. This demonstrates that Internet usage is not restricted to a homogenous population. At this level of utilization, a web-based program is a feasible method to minimize the challenges and barriers noted with intensive face-to-face methods.

There is a growing body of research that shows success using the Internet as a social support method for weight loss methods (Appel et al., 2011; Digenio, Mancuso, Geber & Dvorak, 2009; Krukowski, West, & Harvey-Bernio, 2009; Spring et al., 2013; Tate, Jackvony, & Wing, 2006). Future research has been recommended to evaluate the efficacy, cost effectiveness, and satisfaction levels of Internet-based weight loss methods (Krukowski, West, & Harvey-Berino, 2009). In addition, the use of supplemental in-person sessions with a web-based program has not been reported (Krukowski, West, & Harvey-Berino, 2009). Satisfaction with web-based programs has not been addressed, nor has participant preference.

Potential challenges to Internet-based methods are the remaining need for trained leaders of sessions, technological barriers (such as malfunctions of web-based methods and user errors), and others that may not yet be identified. The gap this study addressed is the efficacy of a web-based social support program, with an additional face-to-face monthly meeting, on weight loss when compared to a face-to-face program alone.

Nurses are at particular risk for obesity due to the unique aspects of their job. Risk factors for obesity that are common to nursing are irregular meal schedules, long work hours, and high levels of job related stress. Han et. al. (2011) reported an association between obesity in nurses and long work hours. Zitkus (2011) reported that the majority of nurses are overweight; which may be related to these risk factors. Many nurse neglect self-care, express feeling uncared for, and express challenges with aging (Nahm, Warren, Zhu, An, & Brown, 2012).

**Study Aims**

The specific aims of this study were:

1. To determine the feasibility, acceptability, and satisfaction levels of registered nurses receiving a web-based social support method (web-based) plus traditional weight loss methods (reduced caloric intake and increased physical activity) when compared to traditional face-to-face social support (face-to-face) plus traditional methods for weight loss.

   *Hypothesis 1a:* The web-based social support method and the traditional face-to-face social support methods will result in similar levels of acceptability and satisfaction levels for registered nurses in both groups.

   *Hypothesis 1b*: A web-based social support program will be a feasible method to use in terms of accessibility, participation rates, ease and compliance of use.

2. To determine the relative effects of a web-based social support plus traditional weight loss program when compared to face-to-face social support plus traditional weight loss program on weight loss outcomes.

   *Hypothesis 2a:* The use of a web-based social support method plus traditional methods of weight loss (reduced caloric intake and increase physical activity) will result in clinically meaningful weight loss.

*Hypothesis 2b:* The intervention of a web-based social support method plus traditional weight loss method over a 12-week period will result in similar weight loss outcomes, in overweight, registered nurses when compared to overweight, registered nurses who receive traditional face-to-face social support plus traditional weight loss methods.

**Significance**

Preliminary studies have shown success with weight loss programs that include social support using methods other than F2F such as individual support via telephone calls, and remote personal support via web-based methods (Appel et al., 2011; Bennett et al., 2012; Digenio, Mancuso, Geber, & Dvorak 2012; Jeffrey et al., 2009; Spring et al., 2013, Tate, Jackvony, & Wing, 2006). Although personal support in group settings, individually, via the telephone, WB, or via email appear to support weight loss when added to traditional methods, there are no known studies that directly compare the efficacy of F2F and WB group sessions. All the studies referenced above used methods of personal support and were single methods or a combination of methods. There are no studies that examine individual satisfaction or preference with WB programs.

This study was undertaken to determine if a WB method of social support was feasible and effective for augmenting weight loss in registered nurses. WB methods of weight loss may be an effective and advantageous option for nurses, who are at risk for obesity in part due to the nature of nursing work. A WB option may offer a variety of times that meet the unique schedules of nurses and eliminate the requirement for travel for F2F social support methods. In addition, this study also examined the gap in knowledge of satisfaction with the method of social support.

**Organization of the Dissertation**

This manuscript is divided into four chapters. Chapter One is a summary and overview of the dissertation and its aims. Chapter Two is a manuscript of the review of the literature related to behavioral and mind-body interventions on weight loss. Chapter Three is a manuscript of the research study that examined the feasibility and efficacy of a WB social support-enhanced intervention when compared to a F2F social support-enhanced intervention on weight loss in nurses. It includes the study aims, methods, interventions, outcomes, sample size, randomization methods, statistical methods, results, and discussion. Chapter Four presents a discussion of the knowledge from the review of literature (Chapter Two), the interpretation of the findings and limitations of the weight-loss study conducted (Chapter Three), and the implications for nursing practice and future research. This chapter also contains a comprehensive reference list for the entire dissertation.

**Chapter 2: Manuscript One: Submitted for Publication to Worldviews on Evidenced-Based Nursing**

Descriptive title: Current Approaches in Behavior Therapy for Weight Loss in Adults: A Critical Review of the Literature

Short title: Current Approaches in Behavior Therapy for Weight Loss in Adults

Julie Ann Sabo MN, RN, APRN, CNS, Doctoral Student
University of Minnesota School of Nursing, 5-140 WDH, 308 Harvard Street SE, Mpls, MN 55455; sabo0042@umn.edu; 651-324-8771

Ruth A. Lindquist, PhD, RN, FAHA, FAAN, Professor
University of Minnesota School of Nursing, 5-140 WDH, 308 Harvard Street SE, Mpls, MN 55455; lindq002@umn.edu; 612-624-5646

Diane Treat-Jacobson, PhD, RN, FAHA, FAAN, Professor
University of Minnesota School of Nursing, 5-140 WDH, 308 Harvard Street SE, Mpls, MN 55455; treat001@umn.edu; 612-625-7613

Address Correspondence to:

Julie Ann Sabo, MN, RN, APRN, CNS
1706 Scheffer Ave
St. Paul, MN 55116
Telephone 651-324-8771
Fax 651-698-6491
sabo0042@umn.edu

## Summary

**Background:** Obesity and being overweight is the fifth leading cause of deaths globally, 44% of the burden of diabetes, 23% of ischemic heart disease, and nearly 14% of the burden of cancer. Many of the consequences of obesity and being overweight are preventable and weight loss can be a preventative measure. Despite efforts to employ traditional methods of weight loss; achieving and sustaining weight loss remains a challenge to many. Adjunct interventions that incorporate bio-behavioral and mind body interventions may improve the success of weight loss programs.

**Aim:** The purpose of this paper is to critically review the recent literature on behavioral and mind-body interventions, to determine which, if any, are effective to achieve weight loss.

**Methods:** MEDLINE, CINAHL; AMED: Allied and Complementary Medicine and The Cochrane Library were searched using key terms of weight loss, behavioral therapy, and complementary therapies. Sixteen papers were included in the analysis.

**Results:** Twelve experimental and four descriptive studies from five countries were identified. Intervention methods used included structured weight loss and education programs that incorporated techniques to change behaviors related to eating, support methods such as in-person and telephone, mind body interventions such as yoga and mindfulness, and acceptance-based interventions. The majority of participants were Caucasian, middle-aged and obese. The addition of structured education, personal support, and mindfulness interventions were demonstrated to have a considerable and positive effect on weight loss. Acceptance Commitment Therapy (ACT) and Acceptance Based Behavioral Therapy (ABBT), both with mindfulness as a basic premise demonstrated the most significant effects.

**Implications for Practice and Research:** Structured education sessions, personal support, and mindfulness, should be considered as adjunct therapies for weight loss. ACT and ABBT hold

particular promise for weight loss efforts. More RCTs are needed on mind-body interventions effects on weight loss.

*Keywords:* weight loss, behavior therapy, review, mind-body interventions

Current Approaches in Behavior Therapy for Weight Loss in Adults:

A Critical Review of the Literature

## INTRODUCTION

This critical review provides an overview of the current state of knowledge on behavior modification techniques and weight loss. This paper is a critical review and synthesis of the available studies examining behavior modification techniques and weight loss, including mind-body interventions, with implications for practice and future research.

### Obesity and Overweight

Obesity and being overweight is the fifth leading cause of deaths globally, contributing to 44% of the burden of diabetes, 23% of ischemic heart disease, and up to 14% of the burden of cancer (World Health Organization, 2013). Obesity is defined as body mass index (BMI: weight in kilograms/meters squared) of greater than 30 and an individual is considered overweight with a BMI over 25. Many of the consequences of being overweight or obese are preventable and weight loss can be achieved as a preventative measure.

The Guideline for the Management of Overweight and Obesity in Adults from the American Heart Association (AHA), American College of Cardiology (ACC) and The Obesity Society (TOS) (Jensen et al., 2013) recommends therapies for weight loss to include restricting calories to 1,200-1,500 calories /day for women and 1,500-1,800 calories/day for men calories using an evidence-based diet for weight loss, participation in a comprehensive lifestyle intervention that is provided in individual or group sessions and which includes increasing physical activity, and personalized feedback. Pharmacotherapy or surgical interventions have also been recommended when other interventions are not effective. First line interventions are dietary restrictions, increased physical activity, and lifestyle changes. Despite our current knowledge and available interventions, weight loss remains elusive for many, and maintenance of

weight loss even more difficult to achieve. Additional therapies, such as mind-body interventions may be needed to assist in weight loss.

**Adjunct Behavioral Therapies for Weight Loss**

Behavior therapy is an intervention for a disorder that uses techniques to modify the behavior that usually accompanies that situation (Beck, 1993). The comprehensive lifestyle intervention described by in the AHA/ACC/TOS guideline (Jensen et al., 2013) includes the use of an evidenced-based reduced calorie diet, increased physical activity and incorporates behavioral therapy to facilitate compliance with the diet and activity. Through behavior therapy, new skills are acquired that allow an individual to change behavior using techniques learned in individual, group, or Web-based sessions. The behavioral intervention may be delivered in person or alternate modes such as by telephone or the Internet. The intervention delivered by any mode should include personalized feedback. Techniques used in behavioral therapy include motivational interviewing, personal support, or coaching. Types of behavior therapy include motivational interviewing, personal support, and coaching. Motivational interviewing uses techniques such as a decisional balance exercise to decrease an individual's ambivalence to changing behavior, with the goal of making positive behavioral changes (Carels et al., 2007). It has been used in addiction treatment and other health related behaviors such as exercise and diet.

The Lifestyle, Exercise, Attitudes, Relationships, Nutrition (LEARN) program is a structured program for weight loss that incorporates education, activity, emotions recognition, examination of relationships, and behavior therapy. LEARN teaches weight loss strategies in a series of group classes. Classes focus on managing caloric intake, healthy eating, exercises, and coping techniques for both short and long term use. The goal is a gradual behavioral change in eating, exercise, and coping strategies to reduce weight and maintain the loss. Personal support and coaching are other techniques used in LEARN to assist in motivation for behavior change.

**Mind-Body Interventions**

Mind-body interventions are practices that incorporate physical activities, such as yoga, and focusing of the mind as in meditation and are taught or administered by others (National Center for Complementary and Alternative Medicine, 2013). Mind-body interventions for weight loss that have been studied include yoga, mindfulness, traditional Chinese medicine (acupressure, breath exercises, qigong: a type of breathing/physical and mental activities), and Acceptance-Based Behavioral Therapy (ABBT). All incorporate one or more physical, mental or emotional techniques to change behavior.

A technique within the category of mind-body interventions is mindfulness. Mindfulness, which has its roots in Buddhist practices, is a type of meditative behavior that enhances present moment thinking (Ludwig & Kabat-Zinn, 2008). Mindfulness is focusing on the moment, enhancing awareness of the moment, and disengaging oneself from thoughts, emotions or beliefs usually associated with that moment. The goal of mindfulness is to foster a greater sense of emotional balance and state of wellness, thus perhaps enabling different reactions to a situation. Mindfulness may increase awareness of an individual's perceptual, cognitive, and affective experiences (Forman, Butryh, Hoffman, & Herbert, 2009). With mindfulness practice, an individual becomes more aware of their actions, response to stimuli, and what they are participating in. Preliminary studies on brain function have demonstrated unique, potential effects of mindfulness practice on prefrontal cortical activity and reduced bilateral amygdala activity (Ludwig & Kabat-Zinn). This change in brain function has been theorized to reduce the intensity and duration of affective responses, thereby reducing subjective anxiety and negative affect (Creswell, Way, Eisenberger, & Lieberman, 2007). Mindfulness has been studied in numerous conditions such as chronic pain, substance abuse, and eating disorders (Ludwig, &

Kabat-Zinn). Mindfulness may help to reduce overeating and improve long-term weight loss by modifying the overeating response to stimuli such as stress and anxiety.

Kripula yoga is a type of standard yoga poses that includes breathwork, meditation, and focusing on sensations one may experience with a pose, or habitual behavior. This focus on sensations has been called "riding the wave" (Braun, Park, & Conboy, 2012), allowing one to fully experience emotional and physical sensations.

**Combined Interventions**

Acceptance and Commitment Therapy (ACT) is a type of behavioral therapy that has two basic components: acceptance and mindfulness, and commitment and behavior changes (Hayes, Levin, Plumb-Vilardaga, Villatte, & Pistorello, 2013), with a desired outcome of psychological flexibility. Similar to Kripula yoga, there is a component of "urge surfing" (Forman et al. 2009), where participants ride the urges related to eating, therefore working through the urge and accepting it. Using the ACT technique of defusion, the participants are able to distance themselves from the urge and see it as a transient mental experience that does not require a corresponding act or suppression of the urge. Mindfulness is incorporated to increase awareness of the experience perceptually, emotionally, and affectively. With the foundation of acceptance, defusion, and mindfulness the participants are then able to choose and commit to choices regarding certain behaviors.

It is evident that there are a range of interventions available to promote weight loss. The empirical effects of these therapies in generating weight loss were of interest. The purpose of this paper was to critically evaluate studies published in the literature between 2000 and 2013 that examined the effects of behavior therapy and mind-body interventions on weight loss in adults.

## METHODS

Databases searched were MEDLINE, CINAHL; AMED: Allied and Complementary Medicine, and The Cochrane Library. The search began in MEDLINE, CINAHL, and AMED by using the keywords "weight loss" and "behavior therapy." The initial results yielded 239 papers. "Weight loss" and "complementary therapies" were then searched, resulting in 106 papers. Limits were placed on the total 345 papers to include only randomized clinical trials (RCT); quasi-experimental, comparative, descriptive or correlational studies; and English language, which reduced the papers to 62. Studies were included whose primary outcome of the intervention was weight loss or change in body mass index (BMI). Studies with secondary outcomes, such as change in blood pressure, emotional or mood states, metabolic markers, were included, although these secondary outcomes are not addressed in this paper. Studies that included any pharmacological or surgical intervention were excluded to focus only on behavioral interventions. Adults were the primary focus, therefore studies of persons less than age 18 or focused solely on the elderly persons were not included. Case reports, meta-analyses, meta-syntheses, unpublished manuscripts, dissertations, and primarily qualitative studies were not included, although some studies did have secondary qualitative outcomes. A total of 16 studies were included in the final analysis. Table A summarizes each study included in this review. All studies were reviewed using a matrix to outline the research aims, variables, sample, methods, results, conclusions and discussion. The sixteen studies were rated good to excellent according to Whittemore (2005) and a majority received the excellent rating.

## RESULTS

Nine of the studies identified were RCTs (Appel et al., 2011, Bennett et al.; 2012, Carels et al., 2008; DiMarco, Klein, Clark, & Wilson, 2009; Elder et al., 2007; Jeffrey et al.; 2009; Lillis, Hayes, Bunting, & Masuda, 2009; Stahre, Tarnell, Hakanson, & Hallstrom, 2007; Tapper et al., 2009; Thiezen et al., 2011). Seven were non-experimental (descriptive, correlational, or

exploratory/pilot) studies (Aggarwal et al., 2012; Braun, Park, & Conboy, 2012; Dalen et al., 2010; Forman et al., 2009; Niemeier, Leahey, Reed, Brown, & Wing, 2012; Sato, Kawamura, & Yamagiwa, 2010). Four of the studies were pilot or exploratory studies, examining the feasibility of an intervention along with its impact on weight loss (Dalen et al.; Forman et al.; Lillis et al.; Niemeier et al.). One study each was from Canada, Japan, Sweden, and United Kingdom, and the remaining were from the United States.

The subjects were primarily women, with ages ranging between 50 to 60 years, Caucasian, with slightly more studies with obese subjects (BMI, of $\geq$ 30 kg/m$^2$). Eight studies (Braun et al., 2012; Dalen et al., 2010; Elder et al., 2007; Forman et al., 2009; Lillis et al, 2009; Niemeier et al., 2012; Sato et al., 2010; Tapper et al., 2009) examined a mind-body intervention, and the remaining interventions focused on traditional coaching or motivational intervention.

**Behavior Therapy for Weight Loss**

The effects of LEARN on body weight were reported in two papers (Aggarwal et al., 2012; Carels et al., 2008). Aggarwal et al. conducted a quasi-experimental study with 44 subjects serving as their own controls in traditional cardiac rehabilitation prior to completing 12 sessions of LEARN. Carels et al. conducted an RCT of 51 subjects receiving LEARN or maintenance intervention. LEARN sessions were similar in length and time of each session (Aggarwal et al. with twelve 90-minute sessions, Carels et al. with sixteen, and 75-minute sessions versus 6 weeks of maintenance sessions). Significant weight loss was seen in both study intervention groups. Both studies included males and females, and subject age and BMI were similar in both studies. All subjects completed the LEARN portion in the Aggarwal et al. study, while Carels et al. reported an attrition rate of 25%. LEARN was associated in both studies with significant impact on weight loss. Both studies ended at 16 weeks with no follow up measures. Limitations of both

studies were small sample sizes and the significant attrition. In these two studies, LEARN appeared to be an effective method of weight loss.

Seven RCTs and one descriptive study were conducted using an instructor-led course along with motivational interviewing, personal support, or coaching to support subjects in their adherence and weight loss. Personal support was provided in-person, with motivational interviewing, by group sessions, via Intranet, or by phone in the Appel et al. (2011), Bennett et al. (2012), DiMarco et al. (2009), Jeffrey et al. (2009), Stahre et al. (2007), and Thieszen et al. (2011) studies. Study subject ages averaged 39 to 56 years; the majority were female and Caucasian. Bennett et al. focused primarily on socioeconomically disadvantaged patients (96.8% minorities, 71.2% Black), and the majority was female. The subject characteristics of age, sex and race were similar between studies.

Three studies (DiMarco et al., 2009; Stahre et al., 2007; Thieszen et al., 2011) measured depression, quality of life (QOL), eating habits, knowledge of eating behaviors, and self-reported changes in mindfulness and eating activity. Tools included were the Beck Depression Inventory (BDI) (DiMarco et al., Thieszen et al.), the Eating Disorder Examination Questionnaire (EDEQ), the Quality of Life Enjoyment and Satisfaction, the Three Factor Eating Questionnaire (TFEQ) (all in DiMarco et al.), and the Short Form-36 Health Survey Version 2 (Thieszen et al.). All are validated and reliable tools used in previous studies. Stahre et al. measured knowledge of obesity with a 20-question/statement survey on central aspects of the teaching program delivered. In all studies, there was significant weight loss in the intervention groups, except for DiMarco et al. DiMarco et al. used guided self-help compared to motivational interviewing. Limitations of this study were small sample size (39 in the intervention group, 19 in the control) with significant attrition (34%; analysis was done on 26 subjects).

Four of the RCTs (Appel, et al., 2011, Bennett, et al., Jeffrey, et al., Thieszen, et al.) had large sample sizes ranging from 213 to 415, with little to no attrition rate. All of these studies demonstrated significant weight loss. Stahre et al. had a sample size of 42 with a large attrition rate prior to start and during the study (60% in the control and 33% in the intervention group). Despite this issue, there was significant weight loss seen in the intervention group with a large effect size (Cohens $d$ = 1.1). Weight loss comparisons are noted in Table A.

In all studies, personal support was given in person, or in a group setting, and in one study (Appel et al.) an adjunct of Web-based instruction was added. Appel et al. compared three groups (control, telephone/Web-based/email, face to face and individual support). The weight loss in both intervention groups was significantly greater than the control groups, and similar between the intervention groups. Personal support in the group settings, individually, Web-based, and via email, appear to support weight loss when added to traditional methods, indicating remote support may be as effective as in-person support. Strengths of these studies are sample sizes and heterogeneity of the populations examined.

In summary, behavioral interventions that included weight loss education programs, such as LEARN, demonstrated positive effects on weight loss in women who are Caucasian or black and between the ages 39-60 years. The addition of personal support, whether individually, by group, Web-based, or via email augmented the effects of the behavioral strategies.

**Mind-body Interventions for Weight Loss**

The effects of Kripula yoga on weight loss, psychological well-being, and health behaviors were described by Braun et al. (2012) in an exploratory study of a 5 day residential Kripula yoga based intervention in obese and overweight subjects. Thirty-one, female, middle aged, Caucasians who were obese (BMI $\geq$ 30) or overweight attended a 5-day Integrative Weight Loss (IWL) workshop. The IWL workshop consisted of 90 minutes daily of Kripula yoga,

lectures, mindful exercises, and nutrition. Outcomes measured were the Health Promoting Lifestyle Profile (HPLP), the Self-Compassion Scale (SCS), the Five Facet Mindfulness Questionnaire (FFMQ), the Profile of Mood States, and self-reported weight loss prior to and one year following the workshop. There was significant attrition at 3 months and one year (51% reported weight at one year). Significant improvements in all scales were seen following the workshop; the HPLP (stress management subscale), SCS, and FFMQ remained significantly improved at 3 months. At one year, significant weight loss was maintained relative to baseline weight; mean weight at baseline was 204.63 pounds (S.D. 42.69) and at one year 187.68 pounds (S.D. 42.89), Cohen's $d = 0.99$, $p < .001$.

There are multiple limitations to the Braun et al. (2012) study including the small sample size, homogenous population, lack of randomization and control, subject recruitment, and attrition. Subjects were recruited from a list of participants who had participated in an IWL at the study center within the last 11 months, thus limiting participation to a small sample population with the potential for existing bias, which limits generalization. The authors discussed the difficulty of translating this type of intervention into community practice, as the conditions would be difficult to replicate (spa-like atmosphere and intensive 5-day residence). Adaptation of the program to community-based practice may be feasible, but would require further study to determine the effectiveness in a different setting.

Dalen et al. (2010) conducted a descriptive pilot study of classes on Mindful Eating and Living (MEAL) for a 6-week series of 2-hour classes. Content in MEAL included mindfulness meditation, mindful eating, and group discussion. Participants were asked to focus on body sensations, emotions, and triggers to overeat. Ten subjects (7 female, 6 Caucasian, 2 Hispanics, 2 Native Americans) who had a mean BMI of 36.2 and a mean age of 44 years were recruited from a local YMCA. Outcomes measured following intervention and 12 weeks after, were TFEQ,

Binge Eating Scale, BDI, Perceived Stress Scale (PSS), Positive and Negative Affect Schedule (PANAS), Kentucky Inventory of Mindfulness Skills (KIMS), weight, and inflammatory markers (C-reactive protein, adiponectin, low-density lipoprotein, and plasminogen activator inhibitor-1). The response rate was high with only one survey incomplete at 3 months. Results showed a significant mean weight loss of 4 kilograms (101 to 97 kg, $p < 0.01$) at 12 weeks, as well as a significant decrease in C-reactive protein. There were no other markers significantly improved. Significant improvement in psychological variables were seen immediately after completion of the intervention, and at 12 weeks following intervention, although improvement of perceived stress was significant at 12 weeks and improvement of anxiety at 6 weeks only. Several limitations are noted; the small sample size, lack of randomization and control group, the short follow-up period, and unknown home compliance with meditation practice. The study strengths include weight loss, and improvement on a majority of the psychological variables. Further research employing techniques of this program appear warranted.

Qigong, Tapas Acupressure Technique (TAT), and a self-directed support (SDS) group and their effects on weight loss maintenance were studied by Elder et al. (2007). A sample of 92 subjects (86% females), mean age of 46, were randomized to one of three arms after a 12 week weight loss program. Subjects participated in 10 hours of meetings over 12 weeks for each group. Qigong consisted of 5 minutes of shaking of the body, other directed movements, and a technique called harvesting the energy. TAT combines acupressure at three points along with mental focuses. SDS consisted of a general overview of weight loss maintenance strategies. Outcomes were measured at 12 and 24 weeks following interventions and included weight, Tellegen Absorption Scale, expectancy of helpfulness of interventions, social support with the Medical Outcomes Study, and Center for Epidemiologic Studies Depression Scale. Weight gain was seen in the SDS and Qigong groups, while the TAT group weight remained stable. There

were no significant findings on the psychological scales. Attendance was higher for TAT participants than those in qigong and significantly higher than the SDS group. The limitations to this study were attrition; 88% completed the study, and perhaps the randomization method (design adaptive allocation). The study was designed as an early phase study to assess qigong and TAT. Despite the lack of weight loss, the authors stated that TAT warranted further study due to the higher compliance and adherence to the intervention of TAT, and the stable weight at 12 and 24 weeks. They surmised that qigong and SDS warranted no further study due to the outcome of weight gain with these interventions.

ACT was studied by Forman et al. (2009), Lillis et al. (2009), Tapper et al. (2009), and Niemeier et al. (2010). ACT includes acceptance, defusing, and willingness skills. All studies were approached as preliminary and feasibility studies. Sample sizes were small (29, 84, 62, and 21 respectively), and comprised primarily female, and a mix of Caucasian and Black subjects.

Forman et al. (2009) incorporated LEARN in the first 2 sessions of a 12-week long acceptance based behavior therapy (ABBT). Lillis et al. (2009) tested a one-time 6-hour session of ACT, and Niemeirer et al. (2010) conducted a weekly one-hour meeting for six months with ABBT. Forman et al. and Niemeirer et al. used a one group quasi- experimental approach, and Lillis et al. used an RCT. Tapper et al. (2009) conducted an RCT comparing four 2-hour workshops of ACT and a weight reducing diet to a control group. Outcomes were BMI, and the exploration of mediating and moderating effects of behaviors. There were a wide range of measures used across all these studies: weight loss, treatment dose, the Weight and Lifestyle Inventory (WALI), the Eating Inventory, the Dutch Eating Behaviors Questionnaire, food related experiential acceptance, the Philadelphia Mindfulness Scale, QOL, the General Health Questionnaire, obesity related QOL, the Weight Stigma Scale, the Acceptance and Action Questionnaire, and the Distress Toleration Scale.

Forman et al. (2009), Lillis et al (2009), and Niemeirer et al. (2010) reported significant weight loss related to ACT, with Forman et al. finding the number of sessions attended and use of food records strongly correlated with weight loss. Tapper et al. did not find a difference in weight loss between groups. Significant improvements in all psychological variables were found in three studies (Forman et al., Lillis et al., Niemeirer et al.), with the exception of WALI in the Forman et al study. Limitations for those three studies were lack of randomization and control groups, homogenous populations, and the wide range of measurement tools. Limitations for Tapper et al. were the small homogenous sample. The weight loss and improvement in psychological variables make this approach worth investigation in future studies with larger samples and more rigorous designs and methods.

Sato, Kawamura, Yamagiwa (2010) conducted a study comparing 20 healthy and 20 overweight pre-menopausal women, examining the effects of Senobi breathing on body fat and autonomic nerve activity (urine noradrenaline, estradiol, growth hormone; and proportion of sympathetic and parasympathetic nerve). Senobi breathing is performed sitting or standing, arms extended with clasped hands, then extending them overhead and stretching backwards. This movement is theorized to activate brown fat cells that may assist in the breakdown of fat, specifically in overweight or obese persons. After one minute of Senobi breathing, the obese women showed a significant change in sympathetic nerve proportion, whereas the healthy women did not show such change. After one month of using this technique, three times a day before each meal, only the obese women had a significant loss of body fat. The authors stated this technique should be used as a first line weight loss method. Limitations to this study were the lack of randomization and control, small sample size without descriptive characteristics, and the lack of comparison between groups.

In summary, mindfulness based interventions, such as ACT and ABBT may augment weight loss when coupled with more traditional methods. Psychological measures of depression, mindfulness, and anxiety appear to improve with mindfulness, ACT, and ABBT interventions. These interventions need more study on larger samples, with randomized designs, and greater rigor. The only noted negative effect of using mind-body interventions was in the use of qigong and SDS, which resulted in weight gain. Despite a lack of weight loss outcomes, and taking into account the limitations of the studies; the two interventions of TAT and Senobi breathing are intriguing and warrant more exploration.

## DISCUSSION

Behavior therapy has been used considerably and endorsed as one of three methods (including physical activity and dietary therapy) for weight loss (NHLBI, 2011). Mindfulness has been studied and shown to be of benefit in a variety of physiological and psychological conditions (Ludwig & Kabat-Zinn, 2008). The synthesis of the reviewed studies shows that with the addition of structured education, personal support, and mindfulness interventions, there are considerable benefits to traditional weight loss methods. Long-term maintenance has not been studied well, thus the long-term benefits on these interventions are not known. Eight studies on behavioral therapy for weight loss included structured education, and in two, personal support or motivational coaching was added. Significant results of weight loss programs were employed in nine of those 10 studies. The LEARN technique was used in two studies and both had significant results. Both studies had small sample sizes and were of short duration (< 16 weeks). In both studies, subjects were mostly women and Caucasian, although Aggarwal et al.'s (2012) study did include some males. Thus, while LEARN appears to be effective, long-term maintenance and generalizability to a broader population is unknown. Studies adding the interventions of personal support, whether by telephone, motivational coaching, Web-based or group sessions, in general,

had longer-term follow up (6 to 24 months), larger sample sizes, and seven of the eight were RCTs.

The impact of motivational interviewing impact on weight loss was mixed. DiMarco et al.'s (2009) study of motivational interviewing when compared to investigator-guided self-help did not have significant results. Motivational interviewing included a decisional balance exercise, which focused on helping participants explore the ambivalence they may feel for making changes, and was done at 2 sessions for one hour each. Appel et al. (2011) incorporated motivational interviewing into personal coaching; the motivational interviewing was done either in-person or by phone, and significant weight loss was reported. The in-person group had up to three monthly contacts and the telephone group received one call per month, along with access to Web-based learning modules and self-reporting of caloric intake, exercise and activity. This increased contact in-person, via telephone, or by Web may have contributed to the difference in results.

The reviewed mind-body interventions' effects on weight loss are promising and intriguing. ACT and ABBT are the most studied of the reviewed studies and show significant benefit for weight loss. Mindfulness incorporating movement (such as Kripula yoga and qigong), had mixed results on weight loss. Qigong was not beneficial, and while Kripula yoga had beneficial results, there were other significant interventions that may have played a role (5-day spa-like atmosphere, residential environment, nutrition classes). Senobi breathing, while interesting and intriguing, needs further study. A common theme to six of the eight studies reviewed is mindfulness (Braun et al, 2012; Dalen et al. 2010; Forman et al., 2009; Lillis et al, 2009; Tapper et al., 2009; Niemeier et al., 2009), and all reported a significant effect on weight loss. However, the small sample sizes, attrition rates, relative homogeneity (Caucasian females) limits the confidence in these findings and the potential generalizability of results.

The epidemic of obesity and being overweight has greatly increased the burden of many diseases financially, sociologically, and emotionally (WHO, 2013). Despite traditional caloric reduction, increased activity, pharmacological and surgical interventions, the problem persists. The use of education programs such as LEARN, paired with personal support appears to have significant impact on weight loss. Therapies that include mind-body interventions such as ACT, ABBT, and mindfulness also significantly impact weight loss.

Although an extensive search of the literature was completed, with redundancies seen during the literature search, there remains the potential that relevant studies were not found or included. In addition, this review focused on a small subset of behavior therapies and mind-body interventions. Therefore, there may be other interventions that have not been included in this review.

**Implications for Practice**

Structured education sessions on weight loss, such as LEARN, should be used in addition to traditional methods outlined by the NHLBI. Personal support individually, in groups, by telephone, Web-based, or via email have been shown to enhance the outcome of weight loss, although the effectiveness of the method of personal support has not been explored. Mind-body interventions, such as ACT, ABBT, and mindfulness have proven to be helpful for weight loss in a few small pilot studies. These interventions appear to be relatively simple to administer and should be considered for practice. As stated previously, there is no single approach that will be effective for all and multifactorial simultaneous interventions may be required for significant outcomes and maintenance.

**Recommendations for Future Research**

More RCTs examining the effects of mind-body interventions on weight loss and psychological markers should be done to validate the outcomes of the reported studies. ACT and

ABBT hold intriguing promise. RCTs that incorporate mind-body interventions, with structured education and personal support are needed that have larger sample sizes. Two interventions that are of interest and warrant more study are TAT and Senobi breathing. However more exploratory work and future RCTs are needed to determine their usefulness.

Personal support given by telephone calls, emails, and Web-based methods have been shown to be an effective adjunct intervention. There is a lack of studies comparing the methods of personal support. More study on methods of personal support is needed to determine the efficacy of the variety of methods.

## References


Aggarwal, S., Arena, R., Cuda, L., Hauer, T., Martin, B., Austford, L., & Stone, J. (2012). The independent effect of traditional cardiac rehabilitation and the LEARN program on weight loss. *Journal of Cardiopulmonary Rehabilitation and Prevention, 32*, 48-53.

Appel, L. Clarck, J., Yeh, H. C., Wang, N. Y., Coughlin, J., Daumit, G., … Brancati, F. L. (2011). Comparative effectiveness of weight-loss interventions in clinical practice. *New England Journal of Medicine, 365*(21), 1959-1968.

Beck, A. (1993). Cognitive therapy: Past, present, and future. *Journal of Consulting and Clinical Psychology, 61*(2), 194-198.

Bennett, G., Warner, E., Glasgow, R., Askew, S., Goldman, J., Ritzwoller, …Colditz, G. (2012). Obesity treatment for the socioeconomically disadvantaged patients in primary care practice. *Archives of Internal Medicine, 172*(7), 565-574.

Braun, T., Park, C., & Conboy, L. (2012). Psychological well-being, health behaviors, and weight loss among participants in a residential Kripula yoga-based weight loss program. *International Journal of Yoga, 22*, 9-21.

Carels, R. A., Darby, L., Cacciapaglia, H. M., Konrad, K., Coit, C., Harper, J., … Versland, A. (2007). Using motivational interviewing as a supplement to obesity treatment: a stepped-care approach. *Health Psychology, 26*(3), 369-374.

Carels, R., Konrad, K., Young, K., Darby, L., Coit, C., Clayton, A., & Oemig, C. (2008). Taking control of your personal eating and exercise environment: A weight maintenance program. *Eating Behaviors, 9*, 228-237.

Creswell, J., Way, B., Eisenberger, N., & Lieberman, M. (2007). Neural correlates of dispositional mindfulness during affect labeling. *Psychosomatic Medicine, 69*, 560-565.

Dalen, J., Smith, B., Shelley B., Sloan, A., Leahigh, L., & Begay, D. (2010). Pilot study: Mindful eating and living (MEAL): Weight, eating behavior, and psychological outcomes associated with a mindfulness-based intervention for people with obesity. *Complementary Therapies in Medicine*, *18*, 260-264.

DiMarco, I., Klein, D., Clark, V., & Wilson, G. (2009). The use of motivational interviewing techniques to enhance the efficacy of guided self-help behavioral weight loss treatments. *Eating Behaviors, 10*, 134-136.

Elder, C., Ritenbaugh, C., Mist, S., Aickin, M., Schneider, J., Zwickey, H., & Elmer, P. (2007). Randomized trial of two mind-body interventions for weight-loss maintenance. *The Journal of Alternative and Complementary Medicine*, *13*(1), 67-78.

Forman, E., Butryh, M., Hoffman, K., & Herbert, J. (2009). An open trial of an acceptance based behavioral intervention for weight loss. *Cognitive and Behavioral Practice, 16*, 223-235.

Hayes, S. C., Levin, M.E., Plumb-Vilardarga, J., Villatte, J.L., Pistorello, J. (2013). Acceptance and commitment therapy and contextual behavioral science: Examining the progress of a distinctive model of behavioral and cognitive therapy. *Behavioral Therapy, 44*(2), 180-198.

Jeffrey, R. Levy, R., Langer, S., Welsh, E., Flood, A. Jaeb, M., …Finch, E. (2009). A comparison of maintenance tailored therapy and standard behavior therapy for the treatment of obesity. *Preventive Medicine*, *49*, 384-389.

Jensen, M. D., Ryan, D. H., Apovian, C. M., Ard, J. D., Comuzzie, A. G., Donato, K. A., ..., Yanovski, S. Z. (2014). AHA/ACC/TOS Guideline for the management of overweight and obesity in adults. A report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines and The Obesity Society. *Journal of the*

*American College of Cardiology*, *63*(25), 2985-3023. Accessed December 12, 2015. http://content.onlinejacc.org/article.aspx?articleid=1770219

Lillis, J., Hayes, S., Bunting, K., & Masuda, A. (2009). Teaching acceptance and mindfulness to improve the lives of the obese: a preliminary test of a theoretical model. *Annals of Behavioral Medicine*, *37*, 58-69.

Ludwig, D., & Kabat-Zinn, J. (2008). Mindfulness in medicine. *Journal of the American Medical Association*, *300*(11), 1350-1352.

National Center for Complementary and Alternative Medicine. (Modified April 1, 2013). Accessed June 30, 2013. http://nccam.nih.gov/health/mindbody

Niemeirer, H., Leahey, L., Reed, K., Brown, K., & Wing, R. (2012). An acceptance-based behavioral intervention for weight loss: A pilot study. *Behavior Therapy*, *43*, 427-435.

Sato, K., Kawamura, T., & Yamagiwa, S. (2010). The "Senobi" breathing exercise is recommended as first line treatment for obesity. *Biomedical Research*, *31*(4), 259-262.

Stahre, L., Tarnell, B., Hakanson, C., & Hallstrom, T. (2007). A randomized controlled trial of two weight-reducing short-term group treatment programs for obesity with an 18 month follow up. *International Journal of Behavioral Medicine*, *14*(1), 48-55.

Tapper, K., Shaw, C. Lisey, J., Hill, A., Bond, F., & Moore, L. (2009). Exploratory randomized controlled trial of a mindfulness-based weight loss intervention for women. *Appetite*, *52*, 396-404.

Thieszen, C., Merrill, R., Aldana, S., Diehl, H., Mahoney, M., Greenlaw, R., …Englert, H. (2011). The Coronary Health Improvement Project (CHIP) for lowering weight and improving psychosocial health. *Psychological Reports*, *109*(1), 338-352.

Whittemore, R. (2005). Combining evidence in nursing research. *Nursing Research*, 54(1), 56-62.

World Health Organization: Fact Sheet on Obesity. (March, 2013). Accessed on May 28, 2013.

http://www.who.int/mediacentre/factsheets/fs311/en/index.html

Supporting information for review and online publication only

Table A

Literature Review Summary

| Study (Date) | Method | Sample/ Characteristics | Results | Critique |
|---|---|---|---|---|
| Aggarwal et al. (2012) | Descriptive: Compare changes in body weight in a cardiovascular cohort participating in the LEARN program following a traditional cardiac rehabilitation program | N = 44, 22 F, mean age 59.8, 70% obese | Weight loss in Cardiac rehab was 0.77 ± 3.2 kg. vs. 6.0 ± 2.9 kg. in LEARN group. Significant weight loss following LEARN relative to cardiac rehabilitation. | Strengths: M and F; Subjects acted as own control; LEARN is a rigorous program. Limitations: Lack of RCT; sample size was small. |
| Appel et al. (2011) | RCT: To study the effects of three arms 1) in-person, 2) remote: telephone contact, Web-based support, 3) control group with no coaching. Support methods: Remote a. Telephone b. Study-specific web site c. Email In-person group & individual sessions with 3 above methods | N = 415, equal randomization, 63% F, 41% black, mean age 54, BMI 36.6 | Weight loss @ 6 months: In-person: 5.8 ± 0.8 kg. Remote: 6.1 ± 0.5 kg. Control: 4.6 ± 0.7 kg. Significant weight loss in both intervention groups (no difference between them) when compared to control. | Strengths: 2- year follow- up; RCT; rigorous and large sample. Limitations: Single center study; poor attendance; compliance was not measured or reported for coaching sessions. |

| Study (Date) | Method | Sample/ Characteristics | Results | Critique |
|---|---|---|---|---|
| | of remote support | | | |
| Bennett et al. (2012) | RCT: To evaluate effectiveness of BFBW (behavior therapy) on weight loss compared to control with socioeconomically disadvantaged adults.<br>Support methods:<br>1. Study website progress monitoring<br>2. Interactive voice response system<br>3. MI monthly the first year (by phone) then every other month the 2nd year<br>4. 12 optional in-person group sessions | N = 365, 96.8% minorities (71.3% black), mean age 54.4, BMI > 30. | Weight loss @ 6 months: BFBW: 1.25 (0.37) kg. Control: .13 (0.35) kg. Significant (but modest) reduction in weight in intervention group compared to control. Weight loss was sustained for intervention at 24 months. | Strengths: RCT, large and diverse sample. Limitations: The US economic environment created additional socioeconomic challenges during the study, thus creating a greater than expected and previous studied disparity in this population. |
| Braun et al. (2012) | Exploratory: To explore the impact of a 5-day residential integrative weight loss program of Kripula yoga, mindfulness, acceptance, self-compassion, commitment, and spirituality on weight loss and psychological markers. | N = 31, all F, middle-aged, Caucasian, 84% obese. | Weight loss @ 1 year: Pre 204.63 (42.69) kg. decreased to 187.68 (42.89) kg; a decrease of 16.95 kg. Significant weight loss at -year follow up in addition to improvements in all psychological markers. | Strengths: Incorporated mindfulness, yoga, weight loss; maintained for long term. Limitations: Unrealistic intervention to translate; lack of RCT; small sample size; and sampling methods; attrition rate for follow up (51% at 1 year). |

| Study (Date) | Method | Sample/ Characteristics | Results | Critique |
|---|---|---|---|---|
| Carels et al. (2008) | RCT: Examine the impact of a 6-week weight maintenance program (didactic, individual activities and assignment's) following the 16-week LEARN program when compared to no program. | N = 51, 84.2% F, 88.65%, Caucasian, age range 46-54 yrs. | Weight loss:<br>No contact: 3.3 lb.(6.2)<br>Maintenance Intervention: 10.1 lb.(7.6)<br>Significant weight loss for both groups following LEARN, and between groups in the maintenance phase. The intervention group continued to lose weight during the 6 weeks while control maintained. | Strengths: RCT; used LEARN- rigorous program.<br>Limitations: sample size; homogenous population; attrition rate of 25%. |
| Dalen et al. (2010) | Descriptive pilot of 6-week mindfulness training, MEAL on mood, metabolic markers, and weight. | N = 10, 7 F, mean BMI 36.9, 6 Caucasian, 2 Hispanic, 2 Native American, mean age 44. | Mean weight loss 4 kg<br>Significant weight loss in all at 12 weeks, significant change in mindfulness, eating behavior and distress, significant reduction in CRP with no change in other biomarkers. | Strengths: Used biomarkers; follow up to 3 months.<br>Limitations: Sample size; not RCT; short follow up; unknown compliance with home portion of program. |
| DiMarco et al. (2009) | RCT: To study the impact of guided self-help combined with MI on weight loss, mood and QOL during the LEARN program.<br>Support methods:<br>MI (guided self-help) | N = 39, 72% Caucasian, 8% Black, 5% Hispanic, 5% SE Asian, 3% Eastern Asian, mean BMI | Weight loss: Not reported<br>No significant differences for all measures between groups. | Strengths: Minorities included; RCT.<br>Limitations: Sample size; measures only immediately after intervention; limited contact for MI group. |

| Study (Date) | Method | Sample/ Characteristics | Results | Critique |
|---|---|---|---|---|
| | | 32.4. | | |
| Elder et al. (2007) | RCT: To determine the feasibility and clinical impact of qigong or TAT or SDS on weight loss maintenance (measured at 24 weeks) following a 12-week weight loss program. | N = 92, 86% F, mean age 46.5. | Weight loss @ 12 weeks:<br>Qigong: + 1.5 kg<br>TAT: -0.1 kg<br>SDS: +0.3 kg<br>TAT group sustained weight loss, while qigong and SDS gained weight. | Strengths: RCT; sample size determined *apriori.*<br>Limitations: Attrition rate (88% completion rate); attendance at classes of TAT and qigong; possibly randomization method (design adaptive allocation). |
| Forman, et al. (2009) | Quasi-experimental: To test the feasibility, acceptability, and effectiveness of ABBT on weight loss. | N = 29, all F, 525 Caucasian, 48% Black, mean BMI 35.8 | Weight loss:<br>Post intervention: 6.65 % decrease in weight<br>@ 6 months 9.65 % weight loss. Authors cited equivalent to other 12-week behavior weight loss programs.<br>Number of sessions and use of food records strongly correlated with weight loss. | Strengths: Follow up at 6 months; initial pilot study of ABBT; measured dosing.<br>Limitations: Not RCT; small sample size; homogenous population. |
| Jeffrey et al. (2009) | RCT: MTT (8 weeks of structured education on weight loss) compared to SBT (group sessions) on weight loss and maintenance of at 18 months.<br>Support methods:<br>Variety of sessions with goals being emphasized at different | N = 213, 52% M, 75% Caucasian, BMI > 33. | Weight loss @ 6 months:<br>SBT: 7.4 (0.5) kg<br>MTT; 5.7 (0.5) kg<br>MTT had significant weight loss at all time points except at week 26-37, the greatest weight loss at 12 weeks, with some weight gain at 10 months | Strengths: RCT; large sample size; some diversity in population; low attritions rate (74% analyzed). |

| Study (Date) | Method | Sample/ Characteristics | Results | Critique |
|---|---|---|---|---|
| | time periods. | | but less than and still with significant loss at 18 months. | |
| Lillis et al. (2009) | RCT: To examine the impact of a 1-day 6-hour ACT session on BMI, mental health, QOL 3 months following the study. | N = 84, majority of subjects middle-aged, Caucasian, F. | Weight loss measured in BMI: ACT: 33.2 $m/kg^2$ (7.30) Control 32.71 $m/kg^2$ (7.10) $p < .01$ Significant reduction in BMI and improvement in all psychometric outcomes. | Strengths: RCT; all 84 analyzed; only three subjects in ACT group lost to follow up at 3 months. Limitations: Homogenous; small sample; lack of repeated measures. |
| Niemeier et al. (2012) | Quasi-experimental: To study the acceptability and feasibility of an ABBT intervention (1-hour meeting for 6 months) for weight loss. | N = 21, 9 F, mean age 52.2, mean BMI 52.8. | Weight loss: 12.0 (1.4) kg. ABBT associated with significant weight loss at baseline and 6 months. | Strengths: Average weight loss was 12 kg better than standard 6-month behavioral weight loss programs. Limitations: Not RCT; small homogenous sample; needs longer follow up. |
| Sato et al. (2010) | Descriptive: To examine the effect of Senobi breathing technique on sympathetic nervous system and loss of body fat. | N = 40 F, 20 normal BMI, 20 with BMI > 30 | Body fat loss: Obese women 3.2 % ($p < 0.01$) Healthy women not reported Senobi breathing significantly impacted sympathetic nervous system, which may activate fat loss, after on month of using 3 times a day the obese F had a significant loss of body fat, whereas normal weight F did not. | Strengths: measured biomarker of sympathetic nervous activity. Limitations: Not RCT; did not compare the 2 groups; small homogenous sample. |

| Study (Date) | Method | Sample/ Characteristics | Results | Critique |
|---|---|---|---|---|
| Stahre et al. (2007) | RCT: To evaluate the efficacy of a weight reducing class combined with a cognitive therapy intervention (10 weeks focused on self-esteem, control, experiences of stress) versus control (10 weeks of usual health and dieting instruction and weight reducing class) on weight loss.<br>Support methods:<br>1. Cognitive group treatment in 4 block sessions<br>a. Questionnaire manual focused on situations that influenced eating behavior<br>b. Review of previous lessons homework<br>c. Theme of lectures related to eating behavior<br>d. New homework relating to the week lecture. | N = 42 F, age 47-50. | Weight loss immediately after:<br>Intervention: 8.6 kg (2.9)<br>Control: 0.7 (1.2) kg<br>Significant mean weight loss in intervention group when compared to control immediately after, and, 6, 12 and 18 months after. | Strengths: RCT; follow up to 18 months; low attrition rate (only one did not complete the intervention, and 6 did not complete control) as compared to other studies.<br>Limitation: Small homogenous sample. |

| Study (Date) | Method | Sample/ Characteristics | Results | Critique |
|---|---|---|---|---|
| Tapper et al. (2009) | RCT: To explore the effectiveness of a brief ACT base group intervention (compared to control) on weight loss. | N = 62 F, age 37-44, BMI 31-32. | Weight loss in BMI: not reported.<br>No significant differences were found in weight loss between groups, BMI, reduction is mediated primarily by reduction in binge eating. | Strengths: RCT; measured mediating and moderating effects.<br>Limitations: Attrition; small, homogenous sample; needs longer follow up. |
| Thieszen et al. (2011) | RCT: To evaluate the association between CHIP intervention and change in body weight and psychological health.<br>Support methods:<br>CHIP: 4-week, 40-hour education intensive life style intervention program. | N 348, age 50.4, 72% F, 95% Caucasian. | Weight loss in BMI:<br>Intervention: 31.1 $m/kg^2$ (7.9), Control: 32.2 $m/kg^2$ (9.0)<br>Significant reductions in BMI at 6 week and 6 months in the intervention group when compared to control, significant improvement was seen in the psychological markers and when compared to control. The greater the decrease in BMI at 6 week and months, the higher the odds of improving psychological health. | Strengths: RCT; large sample.<br>Limitations: Control and intervention groups started the study at different time periods. Although more heterogeneous population than other studies, still heavily Caucasian and female. |

Key to abbreviations:

ABBT: Acceptance based behavioral therapy

ACT: Acceptance commitment therapy

BFBW: Be fit be well

BMI: Body mass index

CHIP: Coronary Health Improvement Project

F: Female

Kg: Kilogram

Lb: Pound

LEARN: Lifestyle, exercise, attitudes, relationships, nutrition

M: Male

MEAL: Mindful eating and living

MI: Motivational interviewing

QOL: Quality of life

RCT: Randomized clinical trial

SBT: Standard behavior therapy

SDS; Self-directed support

TAT: Tapa Acupressure Technique

**Chapter 3: Manuscript Three**

# The Feasibility and Efficacy of a Web-based versus Face-to-Face Social Support-Enhanced Weight Loss Intervention

Julie Ann Sabo MN, RN, APRN, CNS*

Cynthia R. Gross PhD*

Ruth A. Lindquist, PhD, RN, FAHA, FAAN*

Michelle Mathiason Moore, MS*

Kay Savik, MS*

Diane Treat-Jacobson, PhD, RN, FAHA, FAAN*

*University of Minnesota School of Nursing, Minneapolis, MN

Funding for this study was received from the Minnesota Nurses Association Foundation

Address Correspondence to:

Julie Ann Sabo, MN, RN, APRN, CNS
1706 Scheffer Ave
St. Paul, MN 55116
Telephone 651-324-8771

## Summary

**Background:** Over one third of the United States population is classified as obese or overweight and obesity rates have remain unchanged over the last decade. Obesity and being overweight is the fifth leading causes of deaths globally. Lifestyle changes involving diet and activity can be difficult to initiate and even more difficult to maintain. Therefore, achieving and maintaining weight loss remains difficult for many overweight and obese people. Preliminary studies have shown success with weight loss programs that use social support methods other than face-to-face, such as individual support via telephone calls or remote personal support via web-based methods, as an adjunct intervention for weight loss.

**Objective:** The aims of this study were to determine the feasibility and efficacy of a web-based (WB) versus face-to-face (F2F) social-support enhanced weight loss intervention.

**Method:** Registered nurses who had a body mass index (BMI) of over 25 $kg/m^2$ were asked to participate. Participants were randomized to either WB or F2F social support- enhanced weight loss intervention. All participants followed the Dietary Approach to Stop Hypertension, and attended 12 weekly sessions with a social support component delivered via web-based or face-to-face. End points for feasibility were attendance, adherence with nutrition diary, and satisfaction level. End points for efficacy were weight, BMI, blood pressure (BP), and waist to hip ratio (WHR), and were measured at weeks one, five, eight, and twelve. Data were analyzed for between group differences using non-parametric tests.

**Results:** A total of nine participants were enrolled in the study. Participants were all females, with a median age of 42.5 years in the F2F group and 36 years for the WB group. There were no differences between groups for the feasibility end points of attendance, adherence, and satisfaction levels. There were no differences between groups in all efficacy endpoints of

anthropomorphic and BP measurements (except WHR) for all time points. WHR was significantly different between groups, with better outcomes in the WB group. The median weight loss in the WB group was 2.4 kg, and the F2F group 3.8 kg. The change in BMI for the WB group was 0.80 kg/$m^2$ and for the F2F group 1.54 kg/$m^2$.

**Conclusions:** The similar feasibility endpoints of attendance, adherence, and satisfaction levels suggest that a WB social support-enhanced weight loss intervention may be acceptable and feasible alternative to a F2F social support-enhanced weight loss intervention. Conclusions regarding efficacy cannot be formed due to the small sample size and lack of power to detect clinically meaningful differences between groups. The lack of differences between groups is encouraging, and two participants in the F2F group achieved clinically meaningful weight loss of 4.7 and 14.6 kg. Overall findings of this study are consistent with previous studies. Continued studies in web-based methods of social support as an adjunct intervention for weight loss are needed.

*Keywords*: Obesity, social support, weight loss, Internet, feasibility, efficacy

## Introduction and Background

Over one third of the United States population is classified as obese or overweight and obesity rates have been unchanged over the last decade (Ogden, Carroll, Kit, & Flegal, 2014). Obesity and being overweight is the fifth leading cause of deaths globally, contributing to 44% of the burden of diabetes, 23% of ischemic heart disease, and up to 14% of the burden of cancer (World Health Organization, 2013). Medical costs of obesity and being overweight were estimated to be over $147 billion in 2008 (Finkelstein, Trogdon, Cohen, & Dietz, 2009).

Obesity is defined as a body mass index (BMI) of 30 or more, and overweight as a BMI of 25 to 29.9 (National Institute of Diabetes and Digestive and Kidney Diseases, 2012). The Guideline for the Management of Overweight and Obesity in Adults from the American Heart Association (AHA), American College of Cardiology (ACC) and The Obesity Society (TOS) (Jensen et al., 2013) recommended first line therapies for weight loss are:

1. restriction of calories to 1,200-1,500 calories /day for women and 1,500-1,800 calories/day for men using an evidence-based diet for weight loss, and
2. participation in a comprehensive lifestyle intervention that is provided in individual or group sessions and includes increasing physical activity, and personalized feedback.

Lifestyle changes involving diet and activity can be difficult to initiate and even more difficult to adhere to. As a result, achieving and maintaining weight loss remains an elusive goal for many overweight and obese people.

Social support as an adjunct to the first line therapies for weight loss is recommended by the NHLBI (2011) to improve adherence with diet and physical activity. Despite this recommendation, health care providers do not routinely offer counseling or social support

interventions. Reasons given for health care providers' not providing such counseling or social support groups include lack of time, staffing issues, reimbursement, and lack of experience in providing counseling through group support (Digenio, Mancuso, Gerber, & Dvorak, 2009). In addition to those challenges, face-to-face (F2F) groups for social support and counseling require a space in which to meet, on-site trained leaders, and the ability to travel to the meetings. The requirements for travel can be prohibitive to participants, and the providers who are qualified to conduct such support groups may have multiple competing priorities and limited resources.

Group social support has been shown to be more effective than individual support for weight loss interventions (Christakis, Fowler, 2007). Paul-Ebhohimhen et al. (2009) conducted a systematic review of five studies (three from the United States, one from the United Kingdom, and one from Thailand) and found that group-based interventions in females aged 20-76 years, were more effective in achieving weight loss than individual-based interventions

Social support in the context of weight loss has been studied using a variety of methods, including in-person groups , via the Internet, or by phone one-on-one (Appel et al., 2011; Bennett et al., 2012; DiGenio et al., 2009; Spring et al., 2013; Tate, Jackvony, & Wing, 2006). In all the studies where social support as an intervention for weight loss was measured, weight loss was augmented by social support and, when delivered remotely, weight loss was at least equal to that seen in those receiving F2F support. However, there are no known studies that directly compare the efficacy of F2F and web-based (WB) group sessions. Additionally, there are no studies that examine individual satisfaction with WB programs.

The widespread use of the Internet makes WB methods a feasible and potentially advantageous option for interactive social support for weight loss by eliminating the need for meeting space and travel for both participants and presenters. The Pew Research Center's Internet

& American Life Project (2013) reports utilization of the Internet in 85% of the adult population, including people from all income levels, diverse ethnic and racial backgrounds, and those who live in urban, suburban and rural areas. Given this level of utilization, a WB program is a feasible method to minimize the challenges and barriers noted with intensive F2F methods. It has been previously recommended that additional research be conducted to evaluate the efficacy, cost effectiveness, and satisfaction levels of individuals participating in internet-based weight loss interventions (Krukowski, West, & Harvey-Berino, 2009).

Nurses are at particular risk for obesity due to the unique aspects of their job. Risk factors for obesity that are common to nursing are irregular meal schedules, long work hours, and high levels of job related stress. Han et al. (2011) reported an association between obesity in nurses and long work hours. Zitkus (2011) reported that the majority of nurses are overweight; which may be related to these risk factors. Many nurse neglect self-care, express feeling uncared for, and express challenges with aging (Nahm, Warren, Zhu, An, & Brown, 2012). According to the Minnesota Board of Nursing, the average age of a registered nurse (RN) in Minnesota is 47.1 years, and the RN population in Minnesota is not dissimilar to the RN population in the US. Therefore, it is likely nurses in Minnesota share similar attitudes and concerns, about weight, aging, and self-care.

With the increased use of Internet accessibility, regardless of economic status, living location and age of users; the use of a WB method is a feasible option that has shown a positive effect on weight loss in early studies. This study proposes to examine the feasibility and efficacy of a WB versus F2F social support-enhanced weight loss intervention. If effective, this may offer a simpler, less costly, and easily implemented intervention to enhance weight loss.

This study differs from previous studies in that it measures feasibility and efficacy of a WB versus F2F social support-enhanced weight loss intervention. The primary aim of this randomized clinical trial (RCT) was to determine the feasibility, acceptability, and satisfaction levels of participants receiving a WB social support-enhanced weight loss intervention (reduced caloric intake and increased physical activity) when compared to a F2F social support-enhanced weight loss intervention. The secondary aim was to compare the efficacy of the WB and F2F intervention on weight loss outcomes.

## Methods

### Sample Size and Recruitment

The study was approved by the Human Subjects Review Committee at the University of Minnesota, and all patients provided informed consent obtained by the principle investigator (PI). Funding was obtained from the Minnesota Nurses Association Foundation.

Participants were recruited from among the staff of 556 RNs employed at a 337 bed suburban hospital, located in a large Midwestern city. Nine overweight registered nurses (RN) were enrolled through the use of recruitment flyers (Appendix A) and emails containing the same information. Drop-in informational meetings were held at the hospital on three separate dates and times for two hours each. Potential participants were able to call or email the PI for more information or questions.

Previous feasibility studies on weight loss comparing adjunct methods such as social support have ranged from 10 to 31 participants (Dalen et al., 2010; Forman, Buytryh, Hoffman, & Herbert, 2009; Niemeirer, Leahey, Reed, Brown, & Wing, 2012). The goal for this feasibility and acceptability study was 30, with 15 in each group. A total of 15 nurses were screened and nine enrolled. The remaining six gave the following responses for not participating: the twelve week

commitment, interference with work schedules, school, or child schedules. Inclusion criteria were:

- Working as an RN
- Age 18 or greater
- BMI of at least 25 kg/$m^2$
- Willing and able to attend F2F group sessions or WB sessions
- Willing and able to follow the Dietary Approaches to Stop Hypertension (DASH) diet and increase physical activity
- Willing to use an electronic nutrition diary

Exclusion criteria were:

- History of bariatric surgery
- Current use of medications that affect weight, unless on a stable dose
- Pregnant within the past year

**Study Design and Randomization**

This was a two parallel group RCT using a convenience sample of RNs to evaluate the effectiveness of a 12-week WB social support-enhanced weight loss intervention versus a F2F social support-enhanced weight loss intervention. Participants were randomized using a computer generated set of randomization numbers (https://www.randomizer.org/) to the WB or F2F intervention. Participants were randomized by the PI, in the order of arrival to the first meeting, with four randomized to the F2F method, and five in the WB method.

**Interventions**

All participants (F2F and WB) were instructed on how to follow the DASH diet, and participated in 12 weekly sessions of weight loss instruction using the PREMEIR (Appel, et al,

2011) study intervention C. The PREMEIR study was an RCT that examined the effects of three interventions on blood pressure (Appel et al., 2011). Intervention C included a behavioral intervention which consisted of goal setting for weight loss, exercise, sodium and alcohol intake, 14 face-to-face group meetings, 4 individual counseling sessions, use of a food diary, and the DASH diet.

The WB group met via Go To Meeting® once a week for one hour and the F2F group met weekly in person for one hour. In addition to the 12 weekly on-line sessions, the WB group met in person for measurements and a full support meeting, separately from the F2F group on weeks one, five, eight, and 12 for anthropomorphic measurements. The F2F group met weekly with the same measurements taken each week for the participant's knowledge only. Only the data points for weeks one, five, eight, and 12 were analyzed.

Each participant was given a study notebook with session outlines and content from Intervention C (https://research.kpchr.org/Research/Research-Areas/Cardiovascular-Disease/PREMIER), instructed on the use of an electronic nutrition diary, "MyFitnessPal", that allowed for sharing of the nutrition diary between participants and the investigator. Participants were encouraged to enter all intake into the diary, review their intake daily and weekly for high calorie and fatty foods, and to identify trends in their eating habits. Routine review of intake and discussion of intake patters occurred at each weekly F2F or WB group session.

Participants in each group were given the same goals for activity (180 minutes of moderate activity per week), calories (1500/day), and weight loss (minimally 4 kg over 12 weeks). The weight loss goal was determined by review of previous studies with structured weight loss programs. A mean weight loss of 7.9 kg over 6 months was reported in a meta-analysis of seventeen weight loss clinical trials using a program of reduced calorie and increased

physical activity over 6 months (Franz et al., 2007). Based on this meta-analysis and review of the literature, clinically meaningful weight loss for this study was a decrease in weight of at least 4 kg over the 12-week period.

Each session included a check-in on how the past week went for the participants, new content delivery, and a repeat check-in with participants on challenges and success with the diet and exercise. Action plans for the next week were discussed at the conclusion of each session with goals for the week. Appendix B outlines the content presented each week.

A master's level prepared exercise physiologist presented at F2F and WB sessions in weeks one and eight on how to get started exercising, finding time for regular exercise, and setting goals for exercise. A registered dietician attended the F2F and WB sessions in weeks two, three, and six and provided information about finding recipes and cooking methods to reduce fat, calories, and sodium in food. Both guest speakers had extensive clinical experience working with cardiovascular patients in hospital and outpatient settings, and provided information based on the recommendations for activity from the AHA and the DASH diet.

**Measures**

**Anthropomorphic and blood pressure measurement.** Height was measured using a standard wall height chart. Weight was measured using the same digital scale (Taylor® 7407 stainless steel digital scale). Waist to hip ratio (WHR) was measured using a standard anthropometric tape placed midway between the palpated iliac crest and the palpated lowest rib margin in the mid-axillary range. Measurements were taken twice with the mean recorded. Blood pressure was measured twice on the same arm and the mean recorded.

**Feasibility**

Each participant was asked about their adherence with using the nutrition diary, the number of days adhered and if there were technical issues encountered. The WB group adherence with the nutrition diary was done by the investigator reviewing the previous week's diary entries and asking the participant if they had encountered any difficulties using the diary. Adherence was defined as recording at least 1,000 calories per day, unless less was actually consumed, and the number of days with full adherence. Attendance was defined as attending the entire session, 75 percent, less than 75% or not at all. Attendance was taken by the PI at each session for both groups. Satisfaction with the social support method was measured using a numerical rating scale of 1-5, with a higher rating as more positive satisfaction. The satisfaction scale is presented in Appendix C, and was developed from a description of how satisfaction was measured in a feasibility study of Acceptance Based Behavior Therapy (ABBT) on weight loss (Niemeirer, Leahey, Reed, Brown & Wing, 2012).

Measures for feasibility were:

1. Acceptability measured by attendance at each session
2. Adherence measured by days entering $\geq$ 1000 calories into the electronic diary
3. Attrition
4. Satisfaction with social support method (see Appendix C)
5. Technical challenges with electronic diary

Undergraduate nursing students trained in the study procedures and not involved in delivering the interventions, made the physiological measurements, collected adherence data and entered the data into the study database during each visit.

**Statistical methods.** Data were analyzed using SAS version 9.4. The data were not normally distributed and because of the small sample, all data were analyzed using medians,

ranges, and the Mann-Whitney U test. Data comparisons were between week one and twelve only. To examine relationships between variables, Spearman's correlations were performed on feasibility and efficacy data.

## Results

### Participants

There were no significant demographic differences between the groups (see Table 1). All participants were female, Caucasian, the median age was 42.5 (Range 28-59) for the F2F group and 36 (Range 25-61) for the WB group. The majority of participants were married or living with a partner, had a bachelor's degree, a household income of $71,000-100,000, and employed part-time. Self-reported exercise level at visit one ranged from sedentary to vigorous. Although not significantly different, there was a trend in the WB group self-reporting higher levels of exercise at baseline (Chi Sq. = 4.14, d.f. = 1, p = .025). No participants were actively dieting at the time of enrollment. Two individuals in the WB group had a history of migraines, one of whom was on a chronic and stable dose of topiramate which may increase weight loss. Three individuals were taking medications for depression/anxiety (two in the WB, one in the F2F group) or attention deficit disorder (in the WB group). The medications were buspirone, escitalopram, bupropion, citalopram and atomoxetine. Although these medications may affect weight, all were stable, chronic doses.

### Primary Outcomes: Feasibility

All subjects completed the study. There were no differences between the groups in attendance or adherence (see Table 2). The median number of sessions attended for the WB group was 11 and the F2F groups was 9 (Mann-Whitney U, test z = -.63, $p$ = .53). Mean adherence percentage for the WB group was 84% of days and for the F2F group was 91% of days Mann-

Whitney U test, z = .86, $p$ = .39), and the minimum number of sessions attended was eight. There was no attrition in either group

Satisfaction questions asked 1) overall satisfaction with the weight loss program; 2) how helpful it was in the participant's ability to modify their diet, 3) how helpful it was in the participant's ability to modify their activity, 4) ease of following the program; 4) satisfaction level with group assignment; 5) the likelihood of recommending the program to another person (see Appendix C and Table 3). There were no differences between groups for questions on helpfulness, satisfaction and ease of program, although significant differences were seen in the question on whether the participant would recommend the program (see Table 3). (Mann-Whitney U test z = 2.05, $p$ = .04). The F2F group was more likely to provide higher levels of satisfaction.

Correlations between feasibility outcomes are displayed in Table 4. The strongest correlations found were between attendance and adherence, and attendance and weight change. Although no correlations reached significance, attendance and adherence were moderately correlated (r = .62) and approached significance with a $p$ value of .08.

**Secondary Outcomes: Changes in Weight, WHR, BMI, BP**

There were no differences between groups in weight loss, BMI, SBP, or DBP (see Table 5). In both groups, the median weight change was below the criterion for clinically meaningful weight loss, defined in this study of 4 kg, (F2F 3.8 kg, WB 2.4 kg), although the F2F group nearly attained the weight loss goal. Two individuals in the F2F group achieved the weight loss goal (4.7 and 14.6 kg.). Unexpectedly, three participants (1 in the F2F and 2 in the WB) had an increase in the WHR from week one to twelve and the difference between groups was not significant (Mann-Whitney U test, $z$ = 1.84, $p$ = .07).

Correlations between attendance, adherence, systolic and diastolic blood pressure, and change in weight are displayed in Table 4. There were negative correlations between DBP and attendance, adherence, and weight, which are unexplained. These negative correlations may change with a larger sample size. Figure 2 displays the scatterplots of correlations. A review of the scatterplots show that the participant with the largest amount of weight loss and BP change drove the direction of most of the correlations.

Data on weight loss and change in BMI by individual, group assignment, attendance, and adherence rates are displayed in Table 6. The data of change in BMI by individual over the 12 week period are in Figure 1. Clinically meaning full weight loss as defined in this study of 4 kg was seen in only 2 subjects, both in the F2F group, subjects 1 and 8. The largest amount of weight loss was by subject 8 in the F2F group (14.6 kg.), and the least amount was subject 3 in the WB group (0.2 kg.). All participants in both groups lost weight and had a reduction in BMI.

## Discussion

This study compared the feasibility and efficacy of a WB with a F2F social support-enhanced weight loss intervention. There were no differences in feasibility or efficacy end points between groups. There are several limitations, which may impact conclusions, which are discussed later in the paper. Clinical meaningful weight loss, defined in this study of 4 kg, was not achieved in either group, although the F2F group was within .2 kg of the goal and two individuals achieved the weight loss goal. Modest reductions in BP were seen in both groups, and although not significant, may be important clinically and beneficial over time.

The findings in this study are similar to previous studies with larger sample sizes. Appel (2011), Digenio (2009), and Tate (2006) used an email method of WB social support. Email support may result in different level of support than WB support when the group is visualized in

real time. Our findings and those in the literature show alternate methods of social support may be as effective as F2F methods.

**Interpretation**

**Feasibility.** This study is different than those in the literature in that it examined attendance, adherence and satisfaction, in addition to weight loss and change in BMI. There were no differences found between groups for all three feasibility outcomes. Attendance and adherence were positively correlated, and both of those variables were negatively correlated with weight loss and change in BMI, yet in our findings two participants with the largest and smallest weight loss also had the lowest adherence. Therefore, the relationship between attendance, adherence and weight loss and BMI are unclear. A larger sample size may more clearly show differences between the groups. Satisfaction levels for the questions most directly measuring satisfaction with the support method did not differ between the groups, although the F2F group was more likely to rate higher levels of satisfaction, suggesting that either method is acceptable to individuals. The only satisfaction question that was significantly different between groups was the one relating to recommending this program to a friend or relative, which was slightly higher in the F2F group.

Although there were no technical issues with the WB method, the PI perceived the "feel" of the group was different than with the F2F group in that there was less discussion among participants in the WB group than the F2F group. The F2F group had rich discussion, often lasted longer than the scheduled 60 minutes, and had more of a camaraderie feel, which is supported by the higher ratings on the question regarding recommendation of the program to a friend or colleague and the tendency to rate higher levels of satisfaction in general. In the WB group, while discussion occurred among participants, they often required more prompting from the leader (PI)

to draw out participants' thoughts and feelings about their progress. Once discussion began in the WB group, it did produce rich discussion and interaction between participants, although there was never an occasion when the discussion lasted longer than the allotted 60 minutes. It should be noted that the WB group did interact more freely as the study progressed. This increased feeling of "community" or a more intimate relationship, perceived by the PI, between the members may have increased over time had the study lasted longer. Therefore, increasing the length of the intervention may change the social "feel" of the group and impact the amount of weight lost by participants.

Methods that may enhance engagement of participants in the WB group could include the use of engaging posters or graphics on progress of the WB group as a whole and individually. Summary of servings of fruits and vegetables eaten, exercise, and weight lost by week may motivate participants to adhere more to the activity and nutrition goals. It may also serve to as a motivator for participants to share the individual strategies they use to overcome challenges in meeting activity and nutrition goals. The nutrition diary, "MyFitnessPal", includes an activity tracker and all participants in this study shared their diary with other members, thus the potential for "competition" between members existed. Methods to encourage friendly competition may further enhance engagement. WB participants were not asked to report measurement of weight at home between F2F meetings. A weekly weigh-in at home with reporting to the PI may improve adherence to diet and activity, although potential discrepancies between two different scales (home and study scale) and the potential lack of progress may not generate the response desired.

There is a potential that pre-existing relationships between participants could result in additional social support through friendship or cause undue reserve during group sessions because of dislike. While all participants worked in the same hospital, only two had a personal, friendly

relationship outside of the study. Even though these participants were in the same group, neither had clinically meaningful weight loss. The PI is not aware nor sensed any animosity between any of the subjects, so it is unlikely that that existed prior to the study and had an impact on the camaraderie of either group.

**Efficacy**

Conclusions of efficacy are limited due to the small sample size. Clinically significant weight loss, as defined in this study, was not achieved in either group, although the F2F group was only .2 kg below the goal. Although the changes between groups in weight and BMI were not statistically significant, the lack of clinically significant weight loss in the WB group limits the conclusions. Additionally, the difference in individual weight loss by group, and the lack of clinically significant weight loss in the WB group and by two individuals in the F2F group is striking. These findings may be different with a larger sample size or weight loss in the WB group may be achieved at a slower rate yet still reach significance. While an effect size may have been calculated, it may not have been precise due to the small sample and therefore not useful. The increase in WHR was surprising and is unexplained. Potential reasons may be related to bloating due to menstruation, sodium intake or other unknown factors. Therefore the WHR is not a reliable indicator of efficacy in this study. Efficacy of a WB method cannot be determined with this small sample.

The decreases found in both systolic and diastolic blood pressure were consistent with results found in previous studies in individuals following the DASH diet (Svetkey et.al, 2004). Weight loss may result in decreases in blood pressure, which though small may have significant health benefits. Our findings of modest decreases in blood pressure are consistent with previous

studies and may serve as additional motivators for weight loss and indicators of success even with small decreases in weight loss.

There are other factors that may have contributed to the lack of clinically significant weight loss in the WB group. Individuals simply may not have been compliant with the DASH diet or activity goals, and perhaps not truthful in the diary recordings due to the knowledge that the PI was observing the diary. While strategies and barriers to increasing physical activity were discussed at each session in both groups, reporting of ongoing physical activity was not addressed. During the discussions in both groups, individuals stated that increasing activity was difficult and some stated they were unable to increase much, therefore it is not known how much individuals actually changed their activity level.

**Limitations**

The small sample size was a major study limitation. This may have in-part been due to limited session dates, times, and time of year. Potential participants had stated to the PI that the limited session dates and times resulted in their decision to not enroll in the study. The study was conducted in the fall in a northern climate, individuals may not have wanted to participate in anticipation of the holiday season and its associated eating patterns. Conducting the study in the winter may have posed challenges for traveling due to weather. A better option may be in the spring. The session times were in the evening hours, which limited participants to those who did not work in the evening. Strategies to overcome this barrier are to offer multiple sessions throughout the week and at different times during the day. Rolling enrollment dates that would allow participants to start at varying times, or allowing participants to agree to a shorter time commitment with the option to continue the full 12 weeks could result in increased recruitment numbers. While an option such as this might result in participants ending before 12 weeks of

participation, there is also the chance that once the participant started the program and achieved weight loss results, he or she might be motivated to continue participation.

Measurements were taken weekly in the F2F group, although not used in data analysis. The weekly measurements may have served as an unintentional motivator for this group, as the participants shared their progress with others in their group. The measurements were taken at week 1, 5, 8, and 12 for the WB group, although the participants may have been taking their own measurements weekly. This may have been a motivator for those individual participants, but WB participants did not share their progress with others in the WB group as observed in the F2F group. Therefore, motivation for the WB group based on an individual's progress may have been less.

**Generalizability**

The sample of participants in this study was fairly homogenous which limits generalizability. There was a lack of diversity in the subjects in regards to sex, income, education and race. Thus, the findings of this study may not be generalizable to other populations. Populations with different education, income, sex, and race may not show the same results or have a similar response to the intervention methods. The findings may be generalized to other nurses, although greater diversity within nurses is needed. The addition of varied session times and dates would allow for enrollment of nurses who work varied schedules. Additionally, nurses may have a unique response to weight loss interventions; they may be more sensitive than the general population to the consequences of obesity or of being overweight due to exposure to patients with consequences of obesity in their work. This could increase their motivation to lose weight.

**Conclusions**

Although the sample is small, the lack of difference in the feasibility outcomes is encouraging. The similar attendance, adherence, and satisfaction levels suggest that WB social support may be an acceptable and feasible alternative to F2F methods.

Despite the method of social support, attendance has an impact on adherence with the use of a nutrition diary. This lack of adherence may reduce an individual's ability to review and reflect on their diet and ultimately weight loss. Although, the correlations of attendance and adherence on weight changes and BMI were not significant, it is a negative relationship. With a larger sample size, these correlations may have achieved significance. This study was novel in that it replicated a F2F group session via a real time visualization using the Web and measured acceptability and satisfaction. Although, the methods in the previously cited studies vary slightly, the results for all, including this study suggest that alternative methods of social support may be effective as adjunct therapy for weight loss.

WB methods of weight loss may be an effective and advantageous option for nurses, who are at risk for obesity in part due to the nature of nursing work. A WB option may offer a variety of times that meet the unique schedules of nurses and eliminate the requirement for travel for F2F social support methods.

**Implications for Practice and Future Research**

Replication of this study with a larger sample size is needed to demonstrate an effect size and efficacy. A larger study with rolling enrollment dates would enhance recruitment. Other methods to increase the sample size and diversity of subjects may include recruitment at multiples sites, health care clinics, or community centers. With larger sample sizes and taking into account the results of the previous studies and these findings, consideration of utilizing WB methods of social support may offer an alternative to individuals who cannot or choose not to participate in

F2F group sessions.

References

Aggarwal, S., Arena, R., Cuda, L., Hauer, T., Martin, B., Austford, L., & Stone, J. (2012). The independent effect of traditional cardiac rehabilitation and the LEARN program on weight loss. *Journal of Cardiopulmonary Rehabilitation and Prevention*, *32*, 48-53.

Appel, L. Clarck, J., Yeh, H. C., Wang, N. Y., Coughlin, J., Daumit, G., … & Brancati, F. L. (2011). Comparative effectiveness of weight-loss interventions in clinical practice. *New England Journal of Medicine*, *365*(21), 1959-1968.

Bennett, G., Warner, E., Glasgow, R., Askew, S., Goldman, J., Ritzwoller, …& Colditz, G. (2012). Obesity treatment for the socioeconomically disadvantaged patients in primary care practice. *Archives of Internal Medicine*, *172*(7), 565-574.

Christakis, N. A., & Fowler, J. H.(2007). The spread of obesity in a large social network over 32 years. *The New England Journal of Medicine, 357,* 370-379.

Dalen, J., Smith, B. W., Shelley B. M., Sloan, A. L., Leahigh, L., & Begay, D. (2010). Pilot study: Mindful Eating and Living (MEAL): Weight, eating behavior, and psychological outcomes associated with a mindfulness-based intervention for people with obesity. *Complementary Therapies in Medicine*, *18*, 260-264.

Digenio, A. G., Mancuso, J. P., Gerber, R. A., & Dvorak, R.V. (2009). Comparison of methods for delivering a lifestyle modification program for obese patients. *Annals of Internal Medicine, 150,* 255-262.

Finkelstein, E. A, Trogdon, J. G., Cohen, J. W, & Dietz W. (2009). Annual medical spending attributable to obesity: payer-and service-specific estimates. *Health Affairs*, *28*(5), 822-31. doi: 10.1377/hlthaff.28.5.w822.

Forman, E., Butryh, M., Hoffman, K., & Herbert, J. (2009). An open trial of an acceptance based behavioral intervention for weight loss. *Cognitive and Behavioral Practice, 16,* 223-235.

Franz, M. J., VanWormer, J. J., Crain, A. L., Boucher, J. L., Histon, T., Caplan, W., … & Pronk, N. P. (2007). Weight-loss outcomes: A systematic review and meta-analysis of weight-loss clinical trials with a minimum of 1-year follow up. *Journal of the American Dietetic Association, 107,* 1755-1767.

Han, K., Trinkoff, A. M., Storr, C. L., Geiger-Brown, J. (2011). Job stress and work schedules in relation to nurse obesity. *Journal of Nursing Administration.* ; *41*(11): 488-495.

Jeffrey, R. W., Levy, R. L., Langer, S. L., Welsh, E. M., Flood, A. P. Jaeb, M. A., …& Finch, E.A. (2009). A comparison of maintenance tailored therapy and standard behavior therapy for the treatment of obesity. *Preventive Medicine, 49,* 384-389.

Krukowski, R. A., West, D. S. & Harvey-Berino, J. (2009) *Journal of Diabetes Science and Technology, 3,* 184-189

Minnesota Board of Nursing. Current Statistics. https://www.hlb.state.mn.us/reports/current_statistics.pdf. Accessed January, 4, 2013.

Nahm, E. S., Warren, J., Zhu, S., An, M., Brown, J. (2012). Nurse' self-care behaviors related to weight and stress. *Nursing Outlook.* ; *60*: E23-E31.

National Heart, Lung, and Blood Institute. (September, 1998, updated April 2011, in revision October 2012). Clinical guidelines on overweight and obesity. Accessed May 28, 2013. http://www.nhlbi.nih.gov/guidelines/obesity/index.htm.

National Institute of Diabetes and Digestive and Kidney Diseases. (2012). Overweight and Obesity Statistics. Accessed November 10, 2015. http://www.niddk.nih.gov/health-information/health-statistics/Pages/overweight-obesity-statistics.aspx.

Niemeirer, H., Leahey, L., Reed, K., Brown, K., & Wing, R. (2012). An acceptance-based behavioral intervention for weight loss: A pilot study. *Behavior Therapy, 43*, 427-435.

Ogden, C.L., Carroll, M.D., Kit, B.K., Flegal, K.M. (2014). Prevalence of childhood and adult obesity in the United States, 2011-2012. *Journal of the American Medical Association, 311*(8), 806-814.

Paul-Ebhohimhen, V., & Avenell, A. (2009). A systematic review of the effectiveness of group versus individual treatments for adult obesity. *Obesity Facts, 2*, 17-24.

Pew Research Center's Internet & American Life Project. (May 2013). Trend data. Accessed 1/4/2013 from http://www.pewinternet.org/Static-Pages/Trend-Data-(Adults)/Whos-Online.aspx.

Spring, B., Duncan, J. M, Janke, A., Kozak, A. T., McFadden, H. G., DeMott, A., …& Hedeker, D. (2013). Integrating technology into standard weight loss treatment. *Journal of the American Medical Association, 173*, 105-111.

Svertkey, L. P., Simons-Moton, D. G., Proschan, M. A., Sacks, F. M., Conlin, P. R., Harsha, D., & Moore, T. J. (2004) Effect of the Dietary Approaches to Stop Hypertension diet and reduced sodium on blood pressure control. *The Journal of Clinical Hypertension, VI,*VII, 373-381.

Tate, D. F., Jackvony, E. H., & Wing, R. R. (2006) A randomized trial comparing human email counseling, computer-automated tailored counseling, and no counseling in an internet weight loss program. *Archives of Internal Medicine, 166*, 1620-1625.

Trend data. Pew Research Center's Internet & American Life Project. http://www.pewinternet.org/Static-Pages/Trend-Data-(Adults)/Whos-Online.aspx. Published May 2013. Accessed 1/4/2013

World Health Organization: Fact Sheet on Obesity. (March, 2013). Accessed on May 28, 2013. http://www.who.int/mediacentre/factsheets/fs311/en/index.html

Zitkus, B. S. (2011). The relationship among registered nurse' weight status, weight loss regimens, and successful or unsuccessful weight loss. *Journal of the American Academy of Nurse Practitioners.* ; 23:110-116.

Table 1

*Demographic Data*

| | Face-to-Face (SD) n (%) Median (Range) | Web-based (SD) n (%) Median (Range) | Statistic | *p* |
|---|---|---|---|---|
| Total | 4 (100) | 5 (100) | | |
| Female | 4 (100) | 5 (100) | | |
| Age | 42.5 (28-59) | 36 (25-61) | z = .49 | .62 |
| Marital status | | | | |
| Single | 1 (25) | 2 (40) | FET | .99 |
| Married/living with partner | 3 (75) | 3 (60) | | |
| Race | | | | |
| Caucasian | 4 (100) | 5 (100) | | |
| Education level | | | | |
| Associate | 0 (0) | 1 (20) | FET | .99 |
| Bachelor | 3 (75) | 3 (60) | | |
| Graduate | 1 (25) | 1 (20) | | |
| Income | | | | |
| < $50,000 | 1 (25) | 0 (0) | FET | .27 |
| $51,000-70,000 | 0 (0) | 2 (40) | | |
| $71,000-$100,000 | 1 (25) | 3 (60) | | |
| >$100, 001 | 1 (25) | 0 (0) | | |
| Unknown | 1 (25) | 0 (0) | | |
| Employment | | | | |
| Full Time | 1 (25) | 4 (80) | FET | .20 |
| Part Time | 3 (75) | 1 (20) | | |
| Exercise level | | | | |
| Sedentary | 1 (25) | 0 (0) | FET | .52 |
| Light | 3 (75) | 2 (40) | | |
| Moderate | 0 (0) | 2 (40) | | |
| Vigorous | 0 (0) | 1 | | |

FET: Fischer exact text

Table 2

*Feasibility*
*Mann-Whitney U Test*
*Median (Range)*

| | F2F | WB | z | *p* |
|---|---|---|---|---|
| Sessions attended, n | 9.0 (8-10) | 11 (8-12) | .63 | .53 |
| Adherence, % | 91 (75-95) | 84 (38-96) | .86 | .39 |

F2F: Face-to-Face
WB: Web-based

Table 3

*Satisfaction*
*Mann-Whitney U Test*
*Median (Range)*

| | F2F | WB | z | *p* |
|---|---|---|---|---|
| Helpful with eating | 4.5 (4-5) | 4 (3-5) | .96 | .34 |
| 3 | 0 | 1 | | |
| 4 | 2 | 3 | | |
| 5 | 2 | 1 | | |
| Helpful with activity | 4.0 (3-5) | 4 (3-5) | .00 | .99 |
| 3 | 1 | 2 | | |
| 4 | 1 | 3 | | |
| 5 | 1 | 1 | | |
| Ease of program | 5 (4-5) | 4 (3-5) | 1.48 | .14 |
| 3 | 0 | 1 | | |
| 4 | 1 | 3 | | |
| 5 | 3 | 1 | | |
| Overall satisfaction | 5 (4-5) | 5 (3-5) | .44 | .66 |
| 3 | 0 | 1 | | |
| 4 | 1 | 1 | | |
| 5 | 3 | 3 | | |
| Recommend | 5.0 (5-5) | 4.0 (3-5) | 2.05 | .04 |
| 3 | 0 | 1 | | |
| 4 | 0 | 3 | | |
| 5 | 4 | 1 | | |

F2F: Face-to-Face
WB: Web-based

Table 4

*Spearman's Correlations of Attendance, Adherence, and Changes in Weight, SBP, and DBP* (*p*)

| | Attendance | Adherence | Weight | SBP | DBP |
|---|---|---|---|---|---|
| Attendance | 1.0 | .62 (.08) | -.44 (.23) | .43 (.24) | -.41 (.27) |
| Adherence | - | 1.0 | -.27 (.49) | .36 (.34) | -.23 (.56) |
| Weight | - | - | 1.0 | 11 (.78) | -.18 (.65) |
| SBP | - | - | - | 1.0 | .18 (.63) |
| DBP | - | - | - | - | 1.0 |

SBP: Systolic blood pressure
DBP: Diastolic blood pressure
*p: p* value for significance

Table 5

*Efficacy*
*Change observed from Week One and Week 12*
*Mann-Whitney U Test*

| F2F | WB | z<br>Median (Range) | | *p* |
|---|---|---|---|---|
| Weight (kg) | 3.8 (1.9 to14.6) | 2.4 (-2 to3) | 1.35 | .18 |
| WHR (cm) | 3.5 (-4 to7) | -5 (-12 to -2) | 1.84 | .07 |
| BMI ($kg/m^2$) | 1.54 (.78 to4.49) | .8 (.1 to1.29) | 1.35 | .18 |
| SBP (mm) | 5.5 (2 to 40) | 3 (-10 to 5.9) | .49 | .62 |
| DBP (mm) | 2.75 (-3.5 to21) | 1 (-2 to14) | .25 | .81 |

F2F: Face-to-Face
WB: Web-based
WHR: Waist to hip ratio
BMI: Body mass index
SBP: Systolic blood pressure
DBP: Diastolic blood pressure
*p: p value for significance*

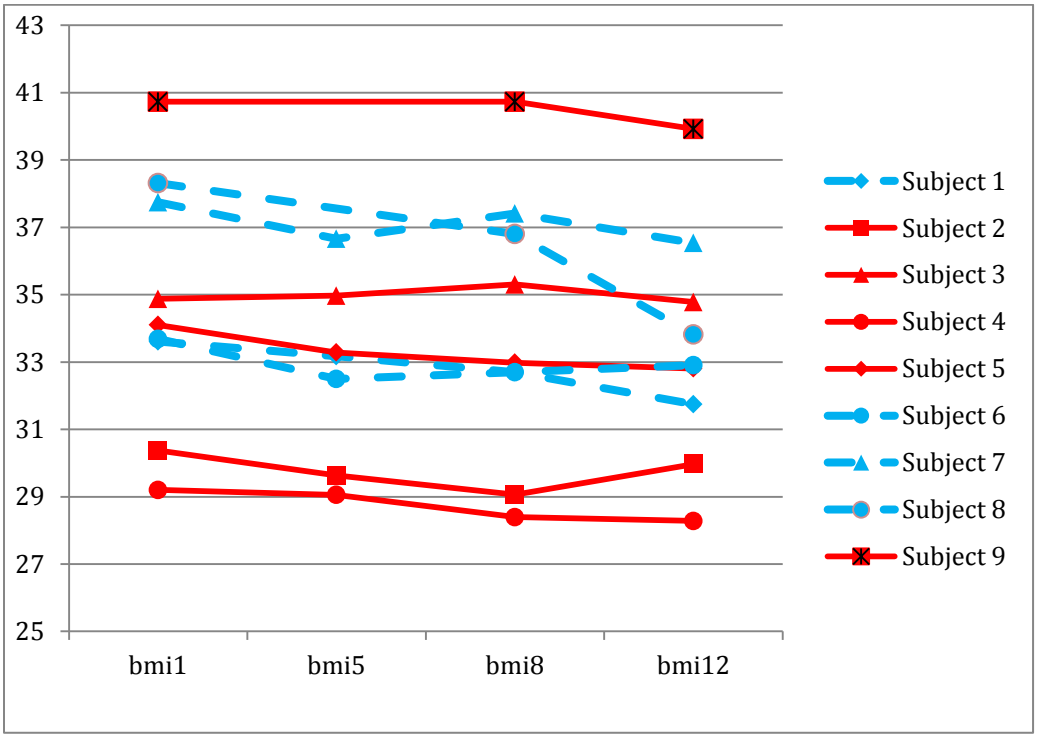
Table 6

*Individual Subject Weight Loss, BMI, Attendance and Adherence*

| Subject | Group | Weight loss | BMI Change | Attendance | Adherence |
|---|---|---|---|---|---|
| 3 | WB | 0.2 | -0.1 | 8 | 38% |
| 2 | WB | 1.2 | -0.4 | 12 | 96% |
| 6 | F2F | 1.9 | -0.8 | 9 | 94% |
| 9 | WB | 2.4 | -0.8 | 8 | 43% |
| 4 | WB | 2.5 | -0.9 | 11 | 87% |
| 7 | F2F | 2.9 | -1.2 | 9 | 95% |
| 5 | WB | 3 | -1.3 | 9 | 91% |
| 1 | F2F | 4.7 | -1.9 | 12 | 84% |
| 8 | F2F | 14.6 | -4.5 | 8 | 75% |

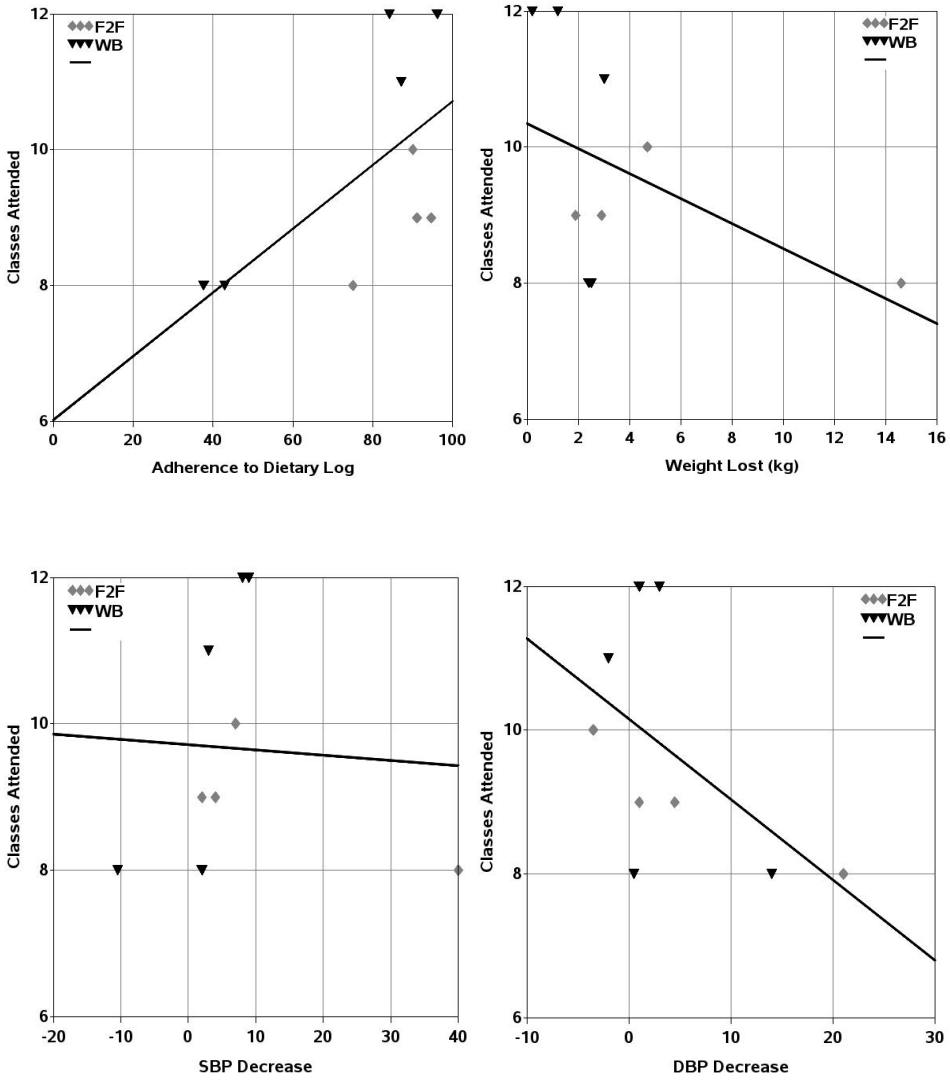
BMI: Body mass index

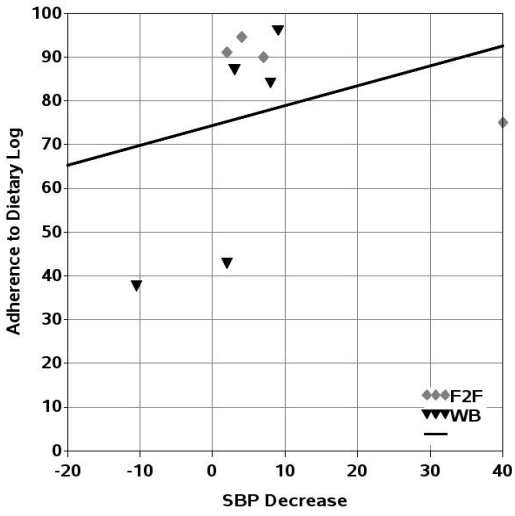
Figure 1. BMI by Subject Over Time
Dashed Blue = WB
Solid Red = F2F

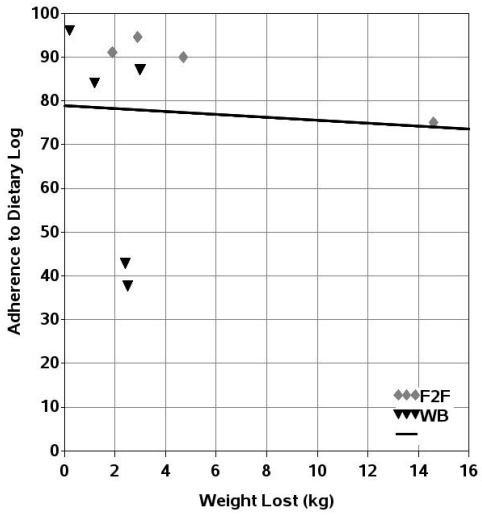


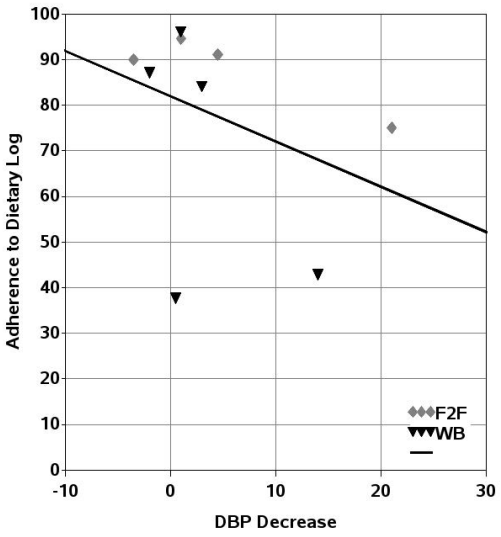

BMI: Body mass index

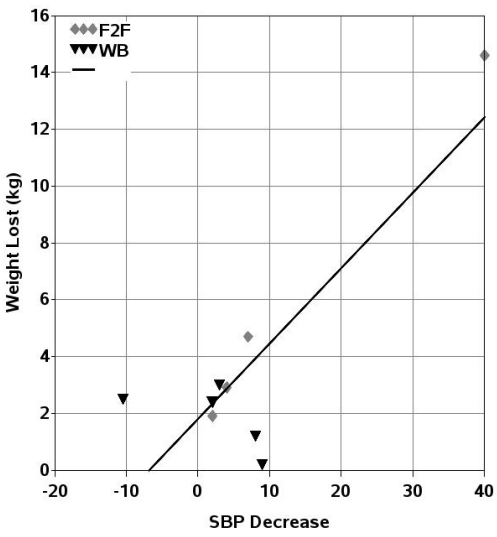
Figure 2. Scatterplots of Correlations

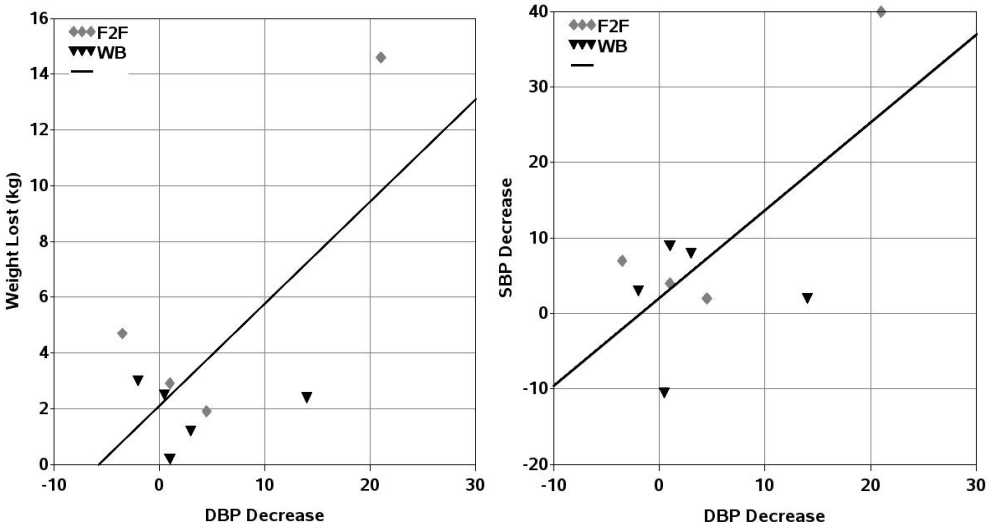



Adherence to Dietary Log
SBP Decrease
F2F
WB


Adherence to Dietary Log
Weight Lost (kg)
F2F
WB


Adherence to Dietary Log
DBP Decrease
F2F
WB


Weight Lost (kg)
SBP Decrease
F2F
WB


F2F
WB
Weight Lost (kg)
DBP Decrease
SBP Decrease
DBP Decrease

## Chapter 4: Discussion

This chapter presents the major findings from each manuscript in this dissertation. First a synthesis of the findings from Chapter Two and Three is presented, including limitations. Lastly, implications for future research are discussed.

### Chapter Two Findings

The primary aim of Chapter 2 was to conduct a critical review and synthesis of the available studies examining behavior modification techniques and weight loss in adults, including mind-body interventions, with implications for practice and future research. The databases searched were MEDLINE, CINAHL; AMED: Allied and Complementary Medicine and The Cochrane Database for Systematic Reviews using the key words of "weight loss", "behavior therapy", and "complementary therapies" is presented. Initial results yielded 345 papers and limits were placed to include only randomized clinical trials (RCT); quasi-experimental, comparative, descriptive or correlational studies; and English language, which reduced the number of papers to 62. Studies with the primary outcome of weight loss and change in BMI were included. Secondary outcomes were not discussed in Chapter Two, although those studies were not excluded. Studies that included pharmacological or surgical interventions for weight loss were not included. A matrix was used to evaluate the final papers and only those rated good to excellent were included. Sixteen papers were in the final analysis.

Ten of the studies identified were RCTs (Appel et al., 2011, Bennett et al.; 2012, Carels et al., 2008; DiMarco, Klein, Clark, & Wilson, 2009; Elder et al., 2007; Jeffrey et al.; 2009; Lillis, Hayes, Bunting, & Masuda, 2009; Stahre, Tarnell, Hakanson, & Hallstrom, 2007; Tapper et al., 2009; Thiezen et al., 2011). Seven were non-experimental (descriptive, correlational, or exploratory/pilot) studies (Aggarwal et al., 2012; Braun, Park, & Conboy, 2012; Dalen et al.,

2010; Forman et al., 2009; Niemeier, Leahey, Reed, Brown, & Wing, 2012; Sato, Kawamura, & Yamagiwa, 2010). Four of the studies were pilot or exploratory studies, examining the feasibility of an intervention along with its impact on weight loss (Dalen et al.; Forman et al.; Lillis et al.; Niemeier et al.). One study each was from Canada, Japan, Sweden, and United Kingdom, and the remaining were from the United States.

The majority of participants were women between the ages of 50-60 years, Caucasian, and considered overweight (BMI $\geq$ 25 kg/m$^2$). Eight studies (Braun et al., 2012; Dalen et al., 2010; Elder et al., 2007; Forman et al., 2009; Lillis et al, 2009; Niemeier et al., 2012; Sato et al., 2010; Tapper et al., 2009) examined a mind-body intervention, and the remaining interventions focused on traditional coaching or motivational intervention.

In Chapter Two, eight studies are presented that used a structured weight loss program along with traditional methods of reduced caloric intake and increased physical activity, and all were shown to be effective. Programs such as Lifestyle, Exercise, Attitudes, Relationships, Nutrition (LEARN) and the Coronary Health Improvement Project (CHIP) incorporate strategies for managing caloric intake, healthy eating, exercises, and coping techniques for both short and long term use. These programs also include behavior therapy techniques that gradually cause a change in eating behavior and exercise patterns, and enhance coping strategies to reduce weight and maintain the loss. In some studies, an adjunct intervention of personal support, whether by telephone, motivational coaching, web-based or group sessions was added and were shown to be effective. Structured weight loss programs that combine an educational component on dietary management, increasing physical activity and coping strategies have been shown to be effective methods of weight loss.

Mind-body interventions are practices that incorporate physical activities, such as yoga, and meditation-type techniques and are taught or administered by others (National Center for Complementary and Alternative Medicine, 2013). Mind-body interventions for weight loss that were included in the review were yoga, mindfulness, traditional Chinese medicine (acupressure, breath exercises, qigong: a type of breathing/physical and mental activities), Acceptance Commitment Therapy (ACT) and Acceptance-Based Behavioral Therapy (ABBT). ACT and ABBT were the most studied types of mindfulness and the most effective. Five studies incorporated ACT or ABBT into a weight loss program. ACT and ABBT, when added to structured weight loss programs, were the most effective mindfulness techniques to affect weight loss. Mindfulness that incorporates physical movements, such as yoga, qigong, and Tapas Acupressure Technique, were inconclusive.

Our findings on motivational interviewing efficacy on weight loss were inconclusive. One of the two studies that used motivational interviewing showed significant weight loss, although other methods of personal support were also used. Therefore, due to only two studies found with inconsistent results, conclusions on the effectiveness of motivational interviewing on weight loss cannot be made.

The findings in Chapter Two demonstrate that structured programs that incorporate education on weight loss strategies, and pair mindfulness techniques such as those used in ACT and ABBT are effective methods of weight loss. Personal support through in-person groups, telephone calls, email or web based support may augment weight loss. Studies that used mindfulness incorporating specific physical movements were inconclusive and may require more study.

**Chapter Three Findings**

Chapter Three describes an RCT comparing the feasibility and efficacy of a web-based (WB) versus a face-to-face (F2F) social support-enhanced weight loss intervention in registered nurses (RNs). Nurses are at particular risk for obesity due to the unique aspects of their job. Risk factors for obesity that are common to nursing are irregular meal schedules, long work hours, and high levels of job related stress. This RCT was a 12-week trial using a structured and validated weight loss program of education using the Dietary Approaches to Stop Hypertension (DASH) diet, increased physical activity, and intervention of social support through a WB or F2F method. Nine RNs were randomized to one of the two groups and met weekly for one hour over a 12-week period F2F or via a WB method. The structured weight loss program was adapted from a study by Appel et. al. (2011). The primary outcome was feasibility as measured by attendance at weekly sessions, adherence with an electronic nutrition diary, and satisfaction levels of the participants. A secondary outcome of efficacy was measured by weight loss, change in BMI, waist-to-hip ration (WHR), and blood pressure.

**Feasibility**

Conclusions cannot be made for feasibility due to the small sample, although the results are encouraging. There were no differences in attendance, adherence, or the majority of satisfaction levels measured between the two groups; although the F2F group was more likely to provide higher levels of satisfaction. The one question that demonstrated a difference between the groups was if the participant would recommend the program to a friend or relative.

Spearman's correlations were performed to examine relationships between variables. The largest correlation was between attendance and adherence (r .62, *p* .08). There were negative correlations between DBP and attendance, adherence, and weight, which are unexplained and may change with a larger sample size. These negative correlations may change with a larger

sample size. There were negative correlations between weight loss and attendance (-.44) and weight loss and adherence (-.27). These correlations make intuitive sense and validate the need for attending sessions and adherence with use of the nutrition diary to reflect and review intake. These reflections may then lead to identification of triggers for overeating and changing behavior patterns that lead to overeating or poor food choices. However, in our findings, individuals who lost the most and least weight both had missed sessions and had low adherence, highlighting that this relationship is not completely consistent. The reminder of participants missed fewer than two sessions and had an adherence of over 80%. Individual review of weight loss by group, taking into account attendance and adherence revealed more sessions missed and more non-adherence in the WB group. The subject who lost the least amount of weight (-.02 KG) had the least adherence (38%), although the subject with the greatest weight loss (-14.6 kg; F2F group) also missed sessions and had the second lowest adherence (43%). The reason for this finding is unclear although a larger sample size may have made the correlations more clear. A review of the scatterplots (Figure 2) show that the participant with the largest amount of weight loss and BP change drove the direction of most of the correlations. There were no technical issues encountered with the WB group.

Despite the lack of differences in the feasibility outcomes, the qualitative feel perceived by the PI, of the two groups differed in that dialogue between members in the F2F was group was freer, rich, and lasted longer than the scheduled weekly time. WB members were more reserved in sharing their challenges and learnings from the weekly goals, and often required prompting from the PI to launch the discussion. As the study progressed, the WB group did participate more freely during the sessions, suggesting that over time, camaraderie was developing and may have continued to grow with additional sessions. Extraneous factors that may have inhibited discussion

between members in the WB group, such as animosity between members prior to or during the study were not observed, and in one case a previous friendship existed.

**Efficacy**

Efficacy was not demonstrated in part due to the small sample size. There were no significant differences in the secondary outcomes by group. All participants did lose weight and had a reduction in BMI. Clinical meaningful weight loss, defined in this study of 4 kg, was not achieved in either group, although the F2F group was within .2 kg of the goal and two individuals achieved the weight loss goal. Modest reductions in BP were seen in both groups, and although not significant, may be important clinically and beneficial over time. There was a significant difference found in the waist-to-hip (WHR) ratio, which is unexplained. Potential reasons may be related to bloating due to menstruation, sodium intake or other unknown factors. Therefore, the focus was placed on the outcomes of weight loss and BMI change.

Both groups experienced small decreases in both systolic and diastolic blood pressure. The largest decreases were in both systolic and diastolic blood pressure in the F2F group, although there were no significant differences between groups. Additionally, change in systolic blood pressure was positively correlated with change in weight. The negative correlation between weight and DBP are unexplained. Although, the changes in systolic and diastolic blood pressure were small and not significant, the decrease may be related to weight loss and may have health benefits. Our findings are consistent with previous studies and may serve as additional motivators for weight loss and indicators of success even with small amounts of weight loss.

The subjective perception by the PI in the difference in the quality or "feel" of the two groups is intriguing. Strategies to enhance engagement of participants in the WB group were explored in Chapter Three. These include use of motivators such as graphics on progress towards

activity, nutrition and weight loss goals, weight measurement by participants and self-reporting results to the PI, or encouraging competition between members. Methods to measure the quality of discussion in the groups may be of help in determining its effect, if any, on the efficacy WB methods of social support. A longer timeline than 12 weeks may affect the quality of exchange in the WB group.

Although significant findings of and feasibility efficacy were not found, participants did lose weight, and two met the study weight loss goal. The lack of significance may be due to the small sample.

**Study Limitations**

This study has several limitations, with the small sample being the most important. Strategies that may improve recruitment may be rolling start dates, utilizing multiple study sites, multiple session dates and times, and perhaps at a different time of year. Allowing enrollment of individuals who may not commit to an entire 12 week program, with the potential that they will continue in the study if success in weight loss is realized, may also improve the number of participants completing or even partially completing the program. The homogenous sample of only RNs, with similar income, education, and race may make generalization to other populations difficult. Again, larger samples with more diversity would strengthen this study.

The time frame of 12 weeks may be too short to discern significant differences in weight loss. A longer study, with follow-up to measure sustainment of weight loss would also add strength to this study.

**Conclusions**

Our findings are similar to the findings of similar studies in the literature. There is a growing body of literature that has promising results of weight loss with methods of social support other than F2F. While this study does not demonstrate efficacy, the feasibility results are

promising and enhanced intervention methods could result in increased weight loss efficacy. Previous studies show promise for efficacy, and the acceptability and attendance levels shown in this study demonstrate the feasibility of WB social support-enhanced weight loss interventions.

Additionally, this study is the only known study that examines feasibility defined as attendance, adherence and satisfaction. It is also the only known study that examines the use of a WB social support method that replicates a F2F method. Other studies have used less personal methods such as phone calls (either automated or with live coaches) and emails. With the variety of methods used to meet in real time with visualization and audio, WB methods may be more effective than less personal approaches. This study contributes to closing the gap in knowledge of WB methods for social support in individuals seeking weight loss.

**Recommendations for Future Research**

Larger studies are needed with nurses, more diverse populations, and larger samples. Utilizing multiple sites, health care clinics or community centers may offer more diverse populations for recruitment. Varying start dates with a longer than 12-week study, and follow up will strengthen the ability to determine significance in efficacy and feasibility.

Structured weight loss programs have been shown to be effective, and the addition of social support has been shown to be an effective adjunct therapy for weight loss. WB methods may be a valuable tool as an adjunct therapy for weight loss, as there are no known negative effects. Further study of alternative methods of social support to enhance traditional weight loss intervention methods will assist in finding new ways to help those struggling with being overweight and obese.

References

Aggarwal, S., Arena, R., Cuda, L., Hauer, T., Martin, B., Austford, L., & Stone, J. (2012). The independent effect of traditional cardiac rehabilitation and the LEARN program on weight loss. *Journal of Cardiopulmonary Rehabilitation and Prevention, 32,* 48-53.

Appel, L. Clarck, J., Yeh, H. C., Wang, N. Y., Coughlin, J., Daumit, G., …& Brancati, F. L. (2011). Comparative effectiveness of weight-loss interventions in clinical practice. *New England Journal of Medicine*, *365*(21), 1959-1968.

Beck, A. (1993). Cognitive therapy: Past, present, and future. *Journal of Consulting and Clinical Psychology*, *61*(2), 194-198.

Bennett, G., Warner, E., Glasgow, R., Askew, S., Goldman, J., Ritzwoller, …& Colditz, G. (2012). Obesity treatment for the socioeconomically disadvantaged patients in primary care practice. *Archives of Internal Medicine, 172*(7), 565-574.

Braun, T., Park, C., & Conboy, L. (2012). Psychological well-being, health behaviors, and weight loss among participants in a residential Kripula yoga-based weight loss program. *International Journal of Yoga, 22,* 9-21.

Carels, R. A., Darby, L., Cacciapaglia, H. M., Konrad, K., Coit, C., Harper, J., … & Versland, A. (2007). Using motivational interviewing as a supplement to obesity treatment: a stepped-care approach. *Health Psychology*, *26*(3), 369-374.

Carels, R., Konrad, K., Young, K., Darby, L., Coit, C., Clayton, A., & Oemig, C. (2008). Taking control of your personal eating and exercise environment: A weight maintenance program. *Eating Behaviors, 9,* 228-237.

Christakis, N. A., & Fowler, J. H.(2007). The spread of obesity in a large social network over 32 years. *The New England Journal of Medicine, 357,* 370-379.

Creswell, J., Way, B., Eisenberger, N., & Lieberman, M. (2007). Neural correlates of dispositional mindfulness during affect labeling. *Psychosomatic Medicine, 69,* 560-565.

Dalen, J., Smith, B. W., Shelley B. M., Sloan, A. L., Leahigh, L., & Begay, D. (2010). Pilot study: Mindful eating and living (MEAL): Weight, eating behavior, and psychological outcomes associated with a mindfulness-based intervention for people with obesity. *Complementary Therapies in Medicine, 18,* 260-264.

Digenio, A. G., Mancuso, J. P., Gerber, R. A. & Dvorak, R. V. (2009). Comparison of methods for delivering a lifestyle modification program for obese patients. *Annals of Internal Medicine, 150,* 255-262.

DiMarco, I., Klein, D., Clark, V., & Wilson, G. (2009). The use of motivational interviewing techniques to enhance the efficacy of guided self-help behavioral weight loss treatments. *Eating Behaviors, 10,* 134-136.

Elder, C., Ritenbaugh, C., Mist, S., Aickin, M., Schneider, J., Zwickey, H., & Elmer, P. (2007). Randomized trial of two mind-body interventions for weight-loss maintenance. *The Journal of Alternative and Complementary Medicine, 13*(1), 67-78.

Finkelstein, E. A, Trogdon, J. G., Cohen, J. W., Dietz, W. (2009). Annual medical spending attributable to obesity: payer-and service-specific estimates. *Health Affairs, 28*(5), 822-31. doi: 10.1377/hlthaff.28.5.w822.

Forman, E., Butryh, M., Hoffman, K., & Herbert, J. (2009). An open trial of an acceptance based behavioral intervention for weight loss. *Cognitive and Behavioral Practice, 16,* 223-235.

Franz, M. J., VanWormer, J. J., Crain, A. L., Boucher, J. L., Histon, T., Caplan, W., …& Pronk, N .P. (2007). Weight-loss outcomes: A systematic review and meta-analysis of weight-

loss clinical trials with a minimum of 1-year follow up. *Journal of the American Dietetic Association, 107,* 1755-1767.

Han, K., Trinkoff, A. M., Storr, C. L., & Geiger-Brown, J. Job stress and work schedules in relation to nurse obesity. *Journal of Nursing Administration.* 2011; 41(11): 488-495.

Hayes, S. C., Levin, M. E., Plumb-Vilardarga, J., Villatte, J. L., & Pistorello, J. (2013). Acceptance and commitment therapy and contextual behavioral science: Examining the progress of a distinctive model of behavioral and cognitive therapy. *Behavioral Therapy, 44*(2), 180-198.

Jeffrey, R.W., Levy, R. L., Langer, S. L., Welsh, E. M., Flood, A. P. Jaeb, M. A., …& Finch, E.A. (2009). A comparison of maintenance tailored therapy and standard behavior therapy for the treatment of obesity. *Preventive Medicine, 49,* 384-389.

Jensen, M. D., Ryan, D. H., Apovian, C. M., Ard, J. D., Comuzzie, A. G., Donato, K. A., ...& Yanovski, S. Z. (2014). AHA/ACC/TOS Guideline for the management of overweight and obesity in adults. A report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines and The Obesity Society. *Journal of the American College of Cardiology, 63*(25), 2985-3023. Accessed December 12, 2015. http://content.onlinejacc.org/article.aspx?articleid=1770219

Krukowski, R. A., West, D. S. & Harvey-Berino, J. (2009) *Journal of Diabetes Science and Technology, 3,* 184-189.

Lillis, J., Hayes, S., Bunting, K., & Masuda, A. (2009). Teaching acceptance and mindfulness to improve the lives of the obese: a preliminary test of a theoretical model. *Annals of Behavioral Medicine, 37,* 58-69.

Ludwig, D., & Kabat-Zinn, J. (2008). Mindfulness in medicine. *Journal of the American Medical Association*, *300*(11), 1350-1352.

Minnesota Board of Nursing. Current Statistics. https://www.hlb.state.mn.us/reports/current_statistics.pdf. Accessed January, 4, 2013.

Nahm, E.S., Warren, J., Zhu, S., An, M., & Brown, J. Nurse' self-care behaviors related to weight and stress. *Nursing Outlook*. 2012; 60: E23-E31.

National Center for Complementary and Alternative Medicine. (Modified April 1, 2013). Accessed June 30, 2013. http://nccam.nih.gov/health/mindbody.

National Institute of Diabetes and Digestive and Kidney Diseases. (2012). Overweight and Obesity Statistics. Accessed November 10, 2015. http://www.niddk.nih.gov/health-information/health-statistics/Pages/overweight-obesity-statistics.aspx.

National Heart, Lung, and Blood Institute. (September, 1998, updated April 2011, in revision October 2012). Clinical guidelines on overweight and obesity. Accessed May 28, 2013. http://www.nhlbi.nih.gov/guidelines/obesity/index.htm.

Niemeirer, H., Leahey, L., Reed, K., Brown, K., & Wing, R. (2012). An acceptance-based behavioral intervention for weight loss: A pilot study. *Behavior Therapy*, *43*, 427-435.

Ogden, C.L., Carroll, M.D., Kit, B.K., Flegal, K.M. (2014). Prevalence of childhood and adult obesity in the United States, 2011-2012. *Journal of the American Medical Association, 311*(8), 806-814.

Paul-Ebhohimhen, V., & Avenell, A. (2009). A systematic review of the effectiveness of group versus individual treatments for adult obesity. *Obesity Facts*, 2, 17-24.

Pew Research Center's Internet & American Life Project. (May 2013). Trend data. Accessed 1/4/2013 from http://www.pewinternet.org/Static-Pages/Trend-Data-(Adults)/Whos-Online.aspx.

Sato, K., Kawamura, T., & Yamagiwa, S. (2010). The "Senobi" breathing exercise is recommended as first line treatment for obesity. *Biomedical Research*, *31*(4), 259-262.

Spring, B., Duncan, J. M, Janke, A., Kozak, A. T., McFadden, H. G., DeMott, A., …& Hedeker, D. (2013). Integrating technology into standard weight loss treatment. *Journal of the American Medical Association, 173,* 105-111.

Stahre, L., Tarnell, B., Hakanson, C., & Hallstrom, T. (2007). A randomized controlled trial of two weight-reducing short-term group treatment programs for obesity with an 18 month follow up. *International Journal of Behavioral Medicine*, *14*(1), 48-55.

Svertkey, L. P., Simons-Moton, D. G., Proschan, M. A., Sacks, F. M., Conlin, P. R., Harsha, D., & Moore, T. J. (2004) Effect of the Dietary Approaches to Stop Hypertension diet and reduced sodium on blood pressure control. *The Journal of Clinical Hypertension, VI,*VII, 373381.

Tapper, K., Shaw, C. Lisey, J., Hill, A., Bond, F., & Moore, L. (2009). Exploratory randomized controlled trial of a mindfulness-based weight loss intervention for women. *Appetite*, *52,* 396-404.

Tate, D. F., Jackvony, E. H., & Wing, R. R. (2006) A randomized trial comparing human email counseling, computer-automated tailored counseling, and no counseling in an internet weight loss program. *Archives of Internal Medicine, 166*, 1620-1625).

Thieszen, C., Merrill, R., Aldana, S., Diehl, H., Mahoney, M., Greenlaw, R., …& Englert, H. (2011). The Coronary Health Improvement Project (CHIP) for lowering weight and improving psychosocial health. *Psychological Reports, 109*(1), 338-352.

Trend data. Pew Research Center's Internet & American Life Project. http://www.pewinternet.org/Static-Pages/Trend-Data-(Adults)/Whos-Online.aspx. Published May 2013. Accessed 1/4/2013

Whittemore, R. (2005). Combining evidence in nursing research. *Nursing Research, 54*(1), 56-62.

World Health Organization: Fact Sheet on Obesity. (March, 2013). Accessed on May 28, 2013. http://www.who.int/mediacentre/factsheets/fs311/en/index.html

Zitkus, B. S., The relationship among registered nurse' weight status, weight loss regimens, and successful or unsuccessful weight loss. *Journal of the American Academy of Nurse Practitioners.* 2011; 23:110-116.

## Appendix A

Are you an RN who would like to lose weight?

Would you like to participate in a weight loss study comparing face-to-face social support to web-based social support methods?

Come hear more on XXXX in room XXX at XXXX.

A study conducted by a nursing doctoral student on the effects of a web-based social support group compared to a face-to-face social support group will begin in November, 2014. Nurses are at particular risk for obesity due to the unique aspects of their job, such as irregular meal schedules, long work hours, and high levels of job related stress.

The purpose of this study is to determine the feasibility and acceptability of a weight loss program for RNs consisting of a web-based social support method plus traditional weight loss methods, and to compare the effects an added web-based support versus a face-to-face social support on weight loss outcomes.

An experimental, two group design of registered nurses will be used. Nurses will participate in a 12 week web-based weight loss program. The primary outcome is weight loss.

To be included in the study you must be an RN, have a body mass index of at least 25 $kg/m^2$, read, write and understand English, be willing and able to attend weekly face-to face sessions or web-based social support sessions for 12 weeks. You will be asked to follow the Dietary Approaches to Stop Hypertension diet, participate in moderate physical activity 3-5 days per week, use an electronic nutrition diary to record your food and drink intake, and have your weight, height, waist to hip ratio, blood pressure, and body mass index measured during the study.

Participants will receive a $5.00 gift care to Target for each session attended.

Anticipated start date is XXXX

For more information, call or email

## Appendix B

Weekly Topical Outline Behavioral Strategies of Lifestyle Changes modified from PREMIER B and following the DASH diet (high in vegetables, fruits, and low-fat dairy products).

| | |
|---|---|
| Week 1 | DASH diet guidelines, goals for fruit/vegetables and diary, physical Activity guidelines, what is moderate level activity, self-monitoring and diary for nutrition and physical activity. Review of alcohol intake guidelines. Review of home activity, nutrition diary, adherence with diet, activity. Challenges and learning's to share with the group. |
| Week 2 | Review of DASH diet and activity guidelines. Review of weekly adherence with diet and activity. Finding the major sources of calories and fat in foods. Review of diet and activity patterns. How to check heart rate to assess exertion with physical activity. Develop and review personal action plan for activity and goals for the week. Review of home activity, nutrition diary, adherence with diet, activity. Challenges and learning's to share with the group. |
| Week 3 | How to find sodium levels in food. Pattern identification of eating and activity. Selection of one action to change lifestyle patter to increase activity level. Review of home activity, nutrition diary, adherence with diet, activity. Challenges and learning's to share with the group. |
| Week 4 | The process of meal management, breakfast patterns. Creating a daily pattern with fruits and vegetables. Review of home activity, nutrition diary, adherence with diet, activity. Challenges and learning's to share with the group. |
| Week 5 | Discuss meal management strategies. Develop and share grocery shopping strategies to meet dietary goals. Develop a plan for lunch menus and how to make lunch lighter. Plan a physical activity schedule. Review of home activity, nutrition diary, adherence with diet, activity. Challenges and learning's to share with the group. |
| Week 6 | Learn about food preparation, recipes and how they affect calorie, fat and sodium intake. Learn low calorie, fat, and sodium cooking methods, and how to increase fruit and vegetable intake. Review of evening meal patterns. Review of home activity, nutrition diary, adherence with diet, and activity. Challenges and learning's to share with the group. |
| Week 7 | Review of snacking patterns. Plan for snacking with fruits and vegetables. Learn about portion sizes. Learn how to seek out social support for maintaining physical activity goals. Review of home activity, nutrition diary, adherence with diet, and activity. Challenges and learning's to share with the group. |

| | |
|---|---|
| Week 8 | How to plan for eating out, eating low calorie, fat and sodium food at restaurants. Learn about calorie, fat, and sodium levels of common foods at restaurants. Become familiar with healthy, fast-food options. Identify new locations for physical activity for more options with various types of weather. Review of home activity, nutrition diary, adherence with diet, activity. Challenges and learning's to share with the group. |
| Week 9 | Review of adherence with DASH diet, physical activity goals. Challenges in maintaining adherence, develop and discuss strategies to keep motivated. Review of home activity, nutrition diary, adherence with diet, activity. Challenges and learning's to share with the group. |
| Week 10 | Physical activity review, identifying other options of activity and locations. Keeping motivated with activity routines. Review of home activity, nutrition diary, adherence with diet, activity. Challenges and learning's to share with the group. |
| Week 11 | Putting it all together, diet, activity, motivation, social support. Slips and other unique situations (holidays, special occasions). Develop maintenance strategies. Identifying triggers to lack of adherence and strategies to overcome. Review of home activity, nutrition diary, adherence with diet, activity. Challenges and learning's to share with the group. |
| Week 12 | Pattern review changes over length of the study. Capitalizing on the achievements and learning from challenges. Develop maintenance strategies. Identifying triggers to lack of adherence and strategies to overcome. |

## Appendix C

Satisfaction Survey

Developed from "An acceptance-based behavioral intervention for weight loss: A pilot study,"

By Niemeirer, H. M., Leahey, L., & Wing, R. A. (2012). *Behavior Therapy*, *43*, 427-435.

Rate each statement from 1-5, with 1 being least likely or not at all and 5 begin very likely and very much.

1. How helpful was this program in modifying the way you eat?

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| Not at all | | | | Very helpful |

2. How helpful was this program in modifying your activity level?

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| Not at all | | | | Very helpful |

3. How easy was the program for you to follow?

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| Not at all | | | | Very easy |

4. How satisfied were you with the group meeting method (face-to-face versus web-based)?

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| Not at all | | | | Very satisfied |

5. How likely are you to recommend this program to a friend or relative?

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| Not at all | | | | Very likely |